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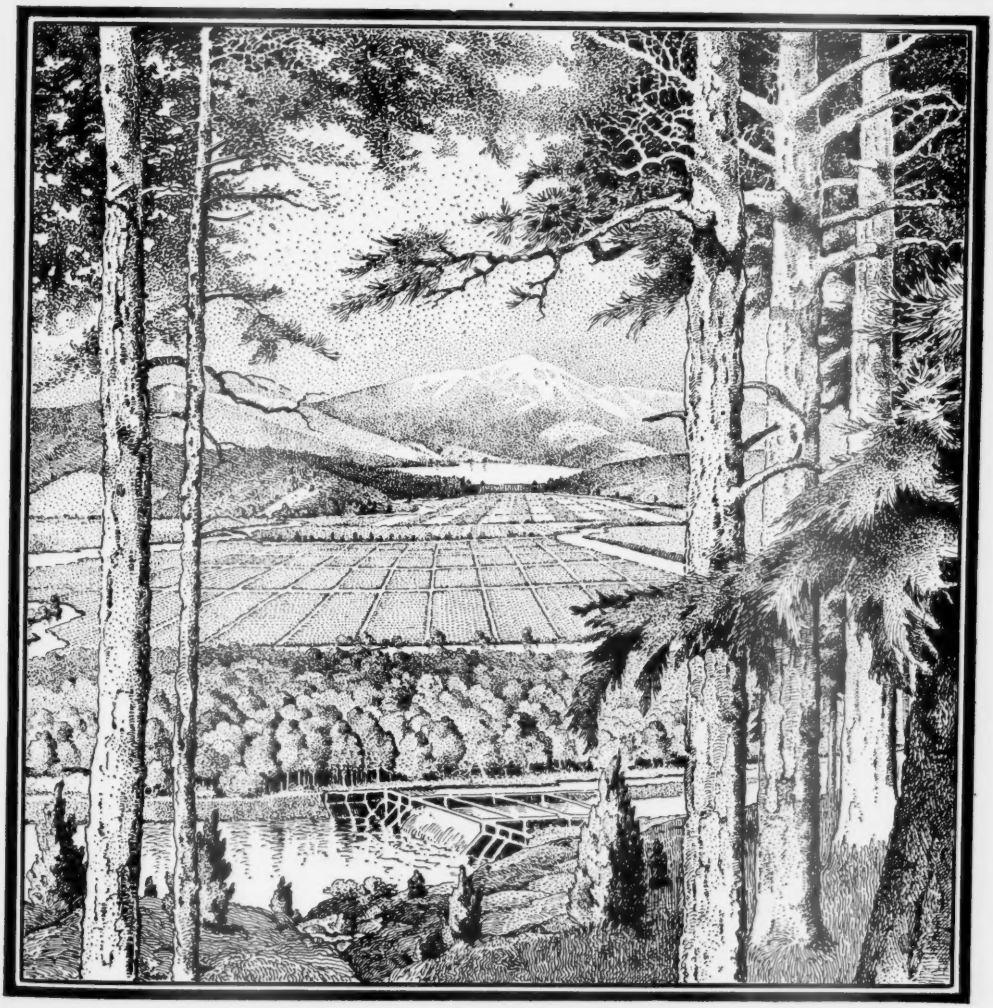

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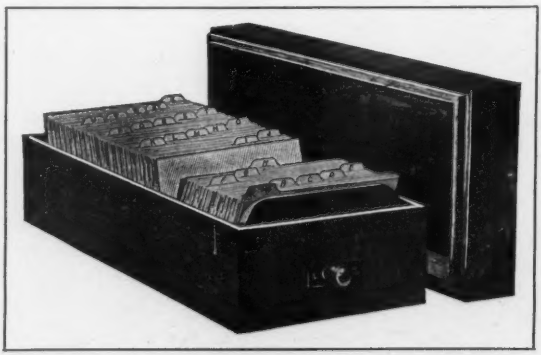

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1. The adoption by the Federal Government of a permanent policy for the reclamation and settlement of the public domain, under which all the remaining public lands shall be held and administered as a trust for the benefit of the whole people of the United States, and no grants of the title to any of the public lands shall ever hereafter be made to any but actual settlers and homebuilders on the land.

2. The preservation and development of our national resources by the construction of storage reservoirs by the Federal Government for flood protection, and to save for use in aid of navigation and irrigation the flood waters which now run to waste and cause overflow and destruction.

3. The construction by the Federal Government of storage reservoirs and irrigation works wherever necessary to furnish water for the reclamation and settlement of the arid public lands.

4. The preservation of the forests and reforestation of denuded forest areas as sources of water supply, the conservation of existing supplies by approved methods of irrigation and distribution, and the increase of the water resources of the arid region by the investigation and development of underground supplies.

5. The adoption of a harmonious system of irrigation laws in all the arid and semi-arid states and territories under which the right to the use of water for irrigation shall vest in the user and become appurtenant to the land irrigated, and beneficial use be the basis and the measure and limit of the right.

6. The holding of an annual Irrigation Congress, and the dissemination by public meetings and through the press of information regarding irrigation, and the reclamation and settlement of the arid public domain, and the possibilities of better agriculture through irrigation and intensive farming, and the need for agricultural education and training, and the creation of rural homes as national safeguards, and the encouragement of rural settlement as a remedy for the social and political evils threatened by the congestion of population in large cities.

Forestry and Irrigation

H. M. SUTER, Editor and Publisher

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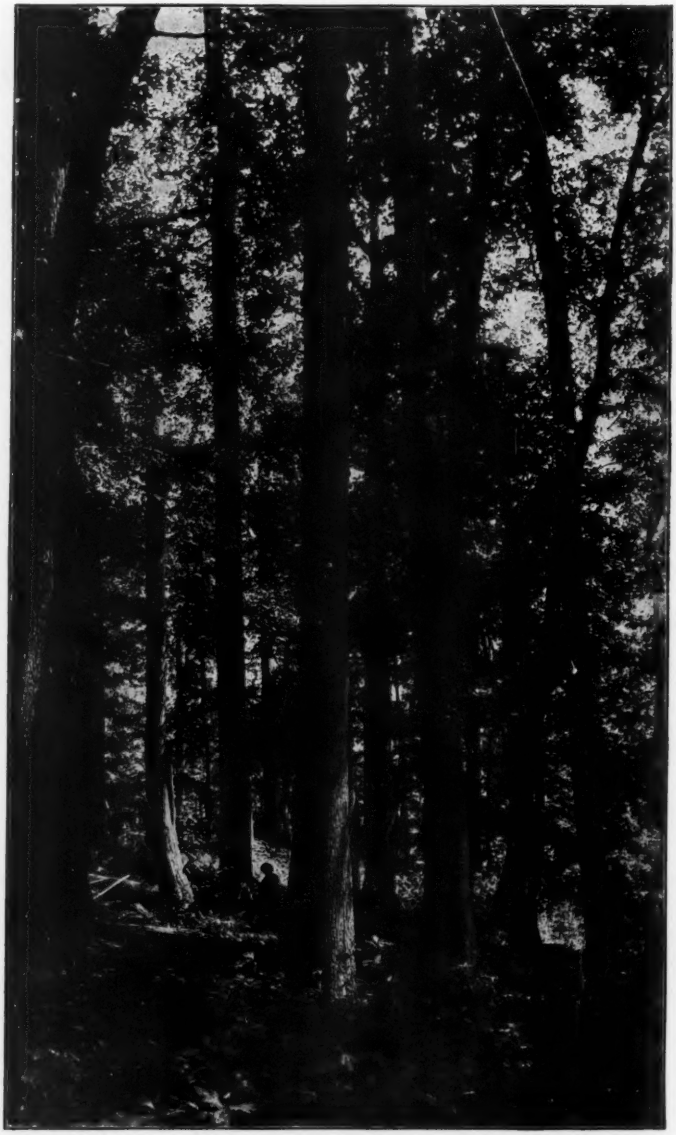


A HARDWOOD FOREST, SHOWING GOOD SPECIMENS OF THE TULIP TREE OR YELLOW POPLAR (LIRIODENDRON TULIPIFERA).

Forestry and Irrigation.

VOL. VIII. OCTOBER, 1902. NO. 10.

NEWS AND NOTES.

At the Yale Forest School. Reports from the Yale Forest School show that the attendance this year will be between 35 and 40. The teaching force has been strengthened by the addition of two new instructors—Mr. R. L. Marston and Mr. Alfred Akerman. A new wood-testing laboratory has been the chief addition to the school equipment.

This new laboratory, the botanical laboratory and herbarium, and the woodlot of 400 acres, of which the school has charge, makes a very complete equipment for instruction.

New York State College of Forestry. Seventy students are registered at the New York State College of Forestry for the collegiate year of 1902–1903. Of these, 30 are old students and 40 are new. Eleven are graduates of other departments of Cornell University and of other colleges and universities. There are 2 seniors, 11 juniors, 17 sophomores, 32 freshmen, and 3 specials.

One special student is a native of the Philippine Islands and a graduate of St. Thomas College, at Manila. Another special student is from Eulenberg Forestry School, Austria.

At Biltmore. The Biltmore Forest School begins the work of the new collegiate year with an attendance of sixteen students, a larger number than ever before. The new building in which the Forest Department of the Biltmore Estate, as well as the school, will hereafter be housed, has been completed. Mr. Ernest Bruncken, of Milwaukee, Wis., has joined the Biltmore staff and will teach forest botany, economics, law, and allied subjects. Mr. Bruncken is the author of "North American Forests and Forestry," he was Secretary of the late Wisconsin Forest Commission, and is an able lawyer.

Last spring seven of the students accompanied Dr. Schenck on an excursion through the forests of Germany and Austria. During the summer, the students were in camp on Pisgah Mountain, where they had opportunities to take part in the various forestal operations carried on under the direction of Dr. Schenck.

Forest School in Nebraska. The University of Nebraska, beginning with the present collegiate year, is offering instruction in forestry. This work will be under the direction of Dr. Charles E. Bessey, the well-known botanist of the university.

A recent letter from Dr. Bessey contains the information that a number of men have taken up the course in forestry at Nebraska. Some of them are well advanced in the scientific course, and are now turning to forestry. It is expected that five or six men will be graduated from the forest department in 1904.

Michigan Forest Schools. Instruction in forestry is to be given at both the University of Michigan, at Ann Arbor, and the Michigan Agricultural College, at Lansing, beginning with the present collegiate year.

The courses in forestry at the University of Michigan will be under the direction of Prof. C. A. Davis. These courses are open only to students who

have received a bachelor's degree from the University of Michigan or from other colleges or universities, and cover two years' work.

At the Michigan Agricultural College the forest work will be under the direction of Mr. C. C. Bogue, who was recently appointed professor of forestry.

Utah Irrigation Congress. The Utah Irrigation Congress held a meeting at Salt Lake City on October 2 and 3. The matter of most importance taken up by the congress was the consideration of irrigation projects in Utah in which the aid of the federal government might be secured. It was decided to recommend the Utah Lake project as being the one which would result in the greatest good to the people of the state.

Mr. F. H. Newell was present and addressed the congress on the irrigation work being done by the federal government under the recently passed reclamation act.

Banquet in Honor of Mr. Maxwell. To show their appreciation of Mr. George H. Maxwell's efforts in behalf of national irrigation, the California section of the National Irrigation Association recently tendered him a complimentary banquet at Los Angeles.

Eighty-five men were present at the banquet, among them being two United States Senators, several Members of the House of Representatives, and leading citizens of California. Addresses were made by Senator Bard and Representative McLachlan, of California, and Senator Quarles, of Wisconsin.

Administration of the Forest Reserves. The Department of the Interior has just issued a new circular outlining the organization, direction, and control of the patrol service in the forest reserves. The weak points of the former loose system of patrol, and its evil effects on rangers and people alike are fully set forth. Under the new plan the ranger of Class I is termed *assistant supervisor*, the ranger of Class II retains the term *ranger*, while the temporary men of Class III are called *guards*. Each grade carries with it a particular rate of salary, and also well-defined authority and responsibility.

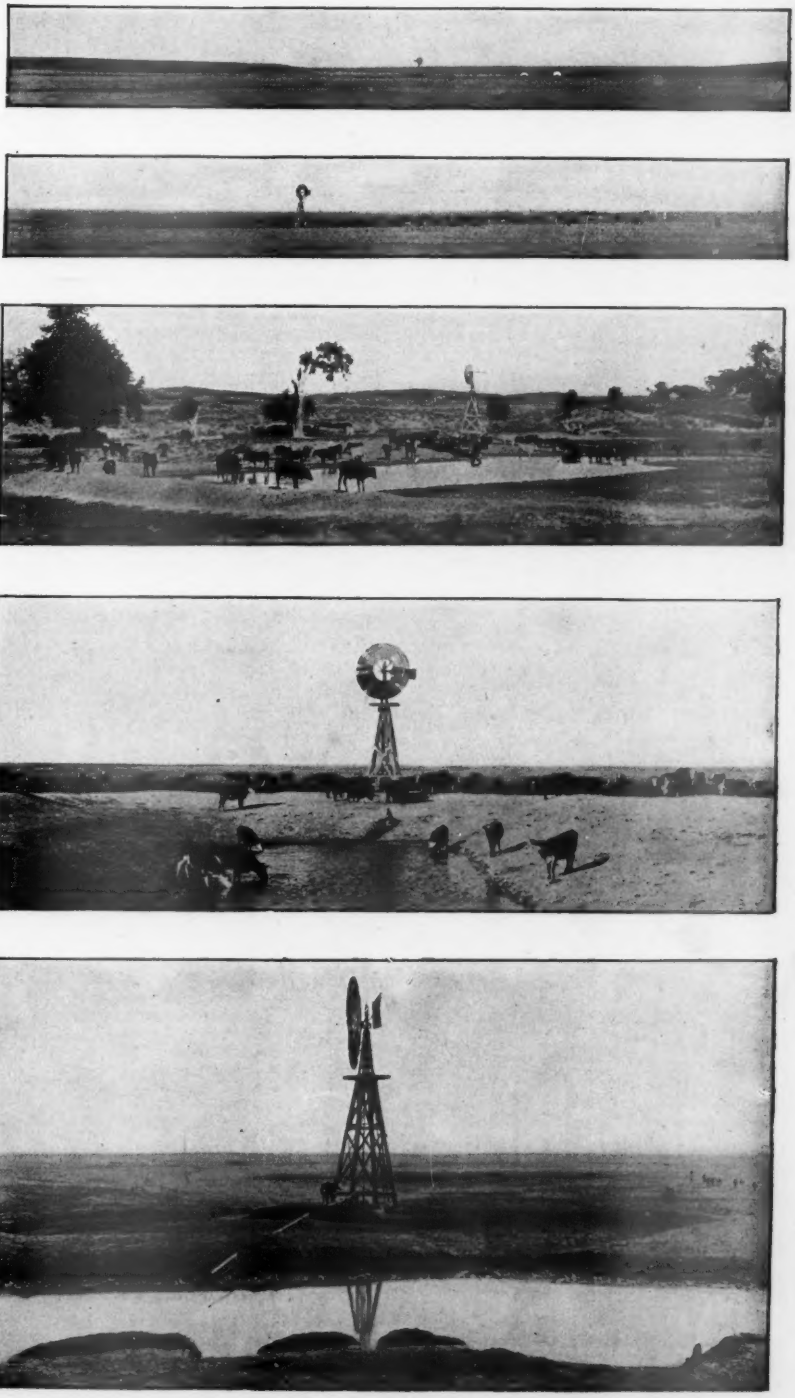
Each reserve is now divided into a number of districts, and each district is placed under a ranger of Class II (*ranger*), with a variable number of guards, the ranger being held responsible for conditions in his district and the proper performance of duties by his guards. Similarly the assistant supervisor (ranger of Class I) is the supervisor's general field man, who looks after all important work in the field—a thing which the supervisors of the larger and more inaccesible reserves are not able to do alone.

Collecting and Planting Forest-Tree Seed. The Bureau of Forestry has men in the field collecting forest-tree seed in view of extensive planting to be done in several localities this winter and next spring. The Forest and Water Association of Los Angeles County, California, has collected over one hundred pounds of the *Pinus attenuata* seed, and Mr. T. P. Lukens, an agent of the Bureau of Forestry, has collected a large quantity of Sugar Pine and Incense Cedar seed, all of which will be planted during the coming winter on the denuded portions of the San Gabriel and San Bernardino Mountains.

A deep interest exists throughout southern California in this forest planting. Arrangements will probably be completed soon for coöperation between the Bureau of Forestry and the boards of trade of Santa Barbara and San Luis Obispo for planting on the mountains near those cities. Much interest has been awakened near the town of Visalia in the same work.

A quantity of pine and cedar seed will be furnished to Mr. F. S. Breen, forest supervisor, for experimental planting in the open parks of the San Francisco Forest Reserve, Arizona.

A large amount of *Pinus ponderosa* seed is being collected in the Black Hills



DEEP-WELL, STOCK-WATERING PLANTS ON THE WESTERN PLAINS.

of South Dakota and the New Mexican Rockies, for planting on the Dismal River Forest Reserve in Nebraska. The red juniper seed, to be used in the same way, are to be obtained from the Platte River region, and the jack pine seed from central Minnesota. A large seed bed has already been completed on the Dismal River Reserve and is now in readiness for planting.

Mr. J. W. Riggs, of Waterloo, Kansas, an agent of the Bureau of Forestry, is collecting conifer seed in New Mexico for trial planting in the drier portions of southwestern Kansas and Oklahoma. There is strong evidence that the conifers which are inured to hot dry situations in the eastern Rockies will thrive on the southwestern plains, and Mr. Riggs expects to give the matter a thorough test.

As stated in the September number of FORESTRY AND IRRIGATION, the New York Forest, Fish, and Game Commission has decided to establish a state nursery for the propagation of seedling trees, which are to be used in reforesting denuded areas in the state forest reserve. Several parties in charge of the foresters employed by the Commission have been collecting red spruce seed, and they have secured about 200 bushels of cones. In the September number, in calling attention to this work, it was erroneously stated that this is not a seed year for Red Spruce. It is not, however, a seed year for White Pine.

Meetings. A convention in the interests of the proposed Appalachian National Forest Reserve has been arranged to be held at Asheville, N. C., on October 25. This meeting, suggested by the Asheville Board of Trade, has been taken up by the Knoxville Chamber of Commerce, the Raleigh Chamber of Commerce, the Newport Board of Trade, and the directors of the Appalachian National Park Association. Prof. J. A. Holmes and other well-known speakers will address the convention.

The Tennessee Forest Association will hold its annual meeting at Knoxville on November 12.

Timber Tests of Native Trees. The scope of work of the Bureau of Forestry has been broadened by the recent organization of a Division of Forest Products, of which Frederick E. Olmsted has been appointed chief.

A series of strength tests of timbers will be made in collaboration with the Bureau of Chemistry. Western timbers of whose strength no exact knowledge has ever been obtained will receive special attention. The Bureau of Forestry has bought a Riehlè testing machine, powerful enough to try the cross-breaking strength of a beam 12 by 12 inches, 16 feet long. The machine's capacity is 200,000 pounds, and it is fitted with an autographic and automatic attachment. Tests are now being made of timbers of the size used in heavy construction work. At present the timber used is bought in the market. Later tests will be made of timbers sawed from trees selected from the forest, in order to establish, if possible, the effect of different localities and conditions of growth on the quality and strength of the wood.

FOR THE PROTECTION OF NEW HAMPSHIRE FORESTS.

AN IMPORTANT MEETING OF THE STATE FOREST ASSOCIATION.

THE Society for the Protection of New Hampshire Forests recently held an important meeting at Concord, N. H., at which steps were taken for the establishment of a reservation in the White Mountain region. A number of distinguished speakers were present from New York, Massachusetts, and other states, which made the gathering a notable one. The widely distributed use of the White Mountains makes them a national breathing spot, and the dis-

cussion of means to preserve the timber on these mountains, particularly on the higher slopes that have been recently purchased by lumber companies, was the key-note of the meeting. Ex-Governor Rollins, president of the society, presided, and Mr. Joseph T. Walker acted as secretary. Addresses were made by Senator William E. Chandler, Mr. Winston Churchill, the author, and a number of others.

Mr. Philip W. Ayers, the society's forester, presented a statement of his investigations for the Society in the mountain regions of the state. He gave a history of the work of the Diamond Match Company in New Hampshire, and of the several pulp companies, including the International Paper Company, J. H. Henry's Sons, the Berlin Mills Lumber Company, and others. He spoke of having met different granges, farmers' institutes, teachers' meetings, and women's clubs throughout the state. According to Mr. Ayers, there is a strong sentiment throughout the state in favor of the establishment of a state nursery for the distribution of trees and seeds adapted to forest growth in New Hampshire. Another subject which the public is coming to regard with favor is the exemption from taxation, for a term of fifteen years, of land properly planted to forest.

Mr. Ayers presented numerous letters favoring a reservation by the federal government in the White Mountains. They were from Col. John Hay, Secretary of State at Washington, D. C.; Rev. Edward Everett Hale, D. D., of Boston; Senator J. H. Gallinger, of New Hampshire; Mr. Filibert Roth, of the General Land Office, and several others. Letters were also presented from Dr. B. E. Fernow, Director of the New York State College of Forestry at Cornell University, and from the Bureau of Forestry at Washington.

Mr. Winston Churchill, the author, was the next speaker. He had conferred with President Roosevelt on the subject, and expressed the President's hearty approval of the plans to save the White Mountains from desecration.

Mr. Orton B. Brown, of the Berlin Mills Lumber Company, was listened to with particular attention, as his company has recently purchased the remaining virgin spruce forest on the northern slope of Presidential Range of mountains. He said the timber was needed by his company for cutting this winter and succeeding winters, but for the coming season they would not cut the points of greatest scenic value unless compelled to do so by business exigencies. He stated that his company would sell the land again at a fair price, being naturally interested in the scenic beauty of the state and anxious to preserve it. They are willing to contribute toward it, but his company could not afford itself to maintain so valuable a piece of land as a public park.

Mr. George H. Moses, Secretary of the New Hampshire State Forestry Commission, presented a motion that the Society heartily coöperate with the committee appointed at Intervale, of which Dr. Edward Everett Hale is chairman, to present the subject before Congress. This motion was unanimously adopted. The committee referred to is one appointed at a meeting held at Intervale, N. H., early in September for the purpose of bringing to the attention of Congress the necessity of establishing a forest reservation in the White Mountains. The committee consists of Dr. Edward Everett Hale, chairman; ex-Governor Frank W. Rollins; Rev. Dr. Daniel Merriman; Hon. A. E. Pillsbury, Boston; Mr. Henry James, 2nd, Cambridge; Prof. J. Raynor Edmands, Cambridge; Mr. J. Stickney, and Mr. H. P. Nichols.

A strong plea for concentration of effort and coöperation of all forces was made by Col. Henry O. Kent, president of the New Hampshire State Forestry Commission, especially in regard to measures to be brought before the New Hampshire Legislature next winter for the establishment of a nursery or some source of supply of seedling trees for distribution throughout the state.

The active support of the Woman's Clubs of New Hampshire was pledged by Mrs. Sarah G. Blodgett, president of the New Hampshire State Federation of Women's Clubs. Several representative club women, including Mrs. Ellen

McRoberts Mason, of North Conway, chairman of the Forestry Committee of the Woman's Clubs, and Mrs. Olive Rand Clark, of Manchester, were present and promised active coöperation.

Among other speakers were Dr. Charles S. Murkland, President of the New Hampshire College of Agriculture, and Mr. F. W. Rane, professor of horticulture and agriculture at that institution; Rev. W. W. Niles, Bishop of New Hampshire; Mr. E. Bertram Pike, of the Pike Manufacturing Company; Mr. Henry James, 2nd, of Cambridge, Mass., formerly editor of the *Forester*, and Mr. W. T. Burgess, editor of the *New England Homestead*, of Springfield, Mass.

A series of resolutions presented by Dr. John D. Quackenbos, of New York, a vice-president of the Society, were approved, in which the Society for the Protection of New Hampshire Forests expressed itself in favor of legislation looking to the establishment of a nursery for the distribution of young trees and seeds, the exemption from taxation for a term of fifteen years of land properly planted, together with a bill to provide for a survey which shall determine the location, character, value, extent, and ownership of the forests in the White Mountain region.

It was felt that if a national reservation in the White Mountains is secured, that the state will coöperate to its utmost extent.

MAJOR JOHN WESLEY POWELL DEAD.

A FAMOUS SCIENTIST AND A PIONEER IN THE IRRIGATION MOVEMENT.

MAJ. JOHN WESLEY POWELL, Director of the Bureau of Ethnology of the Smithsonian Institution at Washington, died at his summer home at Haven, Me., on September 23, and was buried in the national cemetary at Arlington on the 26th.

Maj. John Wesley Powell was one of the world's foremost scientists. He was regarded as the pioneer in the study of ethnology and the chief authority on the subject. He was known equally well as a geologist, anthropologist, and geographer. His contributions to scientific literature include some of the most important works extant, and his official reports, to the number of more than a hundred volumes, are considered scientific text-books.

Major Powell was the son of a Methodist minister, and was born March 24, 1834, at Mount Morris, N. Y. His father's work as a minister took him to all parts of the United States. The elder Powell died while the family was living in northern Illinois. Major Powell was then about fourteen years of age, and he had already demonstrated his fondness for the natural sciences and displayed great aptitude in the study of natural history and geology. He made a number of collections of objects of natural history, one of which found its way to one of the colleges.

He first attracted the attention of the scientific world when, at an early age, he made a trip to Texas, then a perilous journey, to secure the seeds of bois d'arc, commonly known as the osage orange tree, with which to grow hedges and thus solve the fence problem which was bothering the farmers of Illinois and other prairie states. After his return he took a special course at Oberlin College, Ohio, and later was made secretary of the Illinois State Natural History Society.

At the outbreak of the civil war Major Powell enlisted in the Twentieth Illinois Volunteer Infantry. Major Powell served in every rank, from that of private to lieutenant-colonel of artillery, which rank he held in the Second Illinois Artillery at the battle of Shiloh. In this engagement the section of the regiment under his command held a very important position, the holding of which meant victory for the Union forces. Major Powell held it and during the latter part of the battle his right arm

was shattered by a shot in such a manner that it was necessary to immediately amputate it. When the wound had healed sufficiently for him to get out of the hospital, Major Powell rejoined his regiment and remained with it until peace was declared.

At the close of the war he was made professor of geology at the Wesleyan University, at Bloomington, Ill., and was later made professor of geology at Northern University, Illinois. In the summer of 1867 Major Powell led a field class to Colorado, where the summer was spent in study in the Rocky Mountains. This was the first class of this character that ever did such work, and led the way for the establishment of the summer schools of geology that have become an important feature of scientific study.

At that time the valley of the Colorado River was practically unknown. Major Powell formed the idea of exploring it, and with a small party built boats and embarked at Green River, the terminus of the Union Pacific Railroad, in 1868. He made the trip through the Colorado Canyon safely, with the loss of but two of his party, these two having left the expedition to go across country to Salt Lake City. This expedition through the canyon was the first and the only one that has ever been made. Portions of the canyon have been explored, but the entire length has never again been traversed by man.

A second trip through a portion of the canyon was made by Major Powell, accompanied by Prof. A. H. Thompson and J. K. Hillis. The reports on the geological, geographical, and ethnographical conditions of this valley led to the establishment of the United States Geographical and Geological Survey of the Rocky Mountain region in 1870, and led also to a continuance of the work of exploration and investigation.

Nine years later the four surveys, then operating under the authority of the government, which included the one just mentioned, the Hayden survey, King survey, and Wheeler survey, were combined, and the present United States Geological Survey was organized, with Prof. Clarence King as director. At the same time the Bureau of Ethnology was organized and Major Powell placed at the head of it. A year later Professor King resigned, and Major Powell was selected to take his place as director of the Geological Survey.

During the time he was at the head of the Survey, Major Powell evolved a plan for the irrigation of the less humid regions of the West, which was discussed at length by Congress. The plan adopted by the government, as embodied in the bill passed at the last session of Congress, is almost identical with the plan proposed by Major Powell. In

MAJOR JOHN WESLEY POWELL.

1894, owing to trouble with his arm, Major Powell resigned his directorship and entered Johns Hopkins Hospital, Baltimore, where he underwent an operation. He subsequently resumed his scientific work as director of the Bureau of Ethnology, and was the director of the Bureau up to the time of his death. He made many important contributions to philosophy, and by many scholars is held to rank with such men as Herbert Spencer, Comte, and Bacon. His many scientific papers and addresses have been published from time to time, and include several hundred titles.

During his lifetime Major Powell received a number of honorary degrees from educational institutions throughout the world. The most important of these were the degrees of Ph. D. from the University of Heidelberg, Germany, and LL. D. from Harvard; he also received the degree of LL. D. from the Columbian University of this city, Ph. D. and LL. D. from the Wesleyan University of Illinois, and A. M. from the Illinois State College.

THE TENTH NATIONAL IRRIGATION CONGRESS.

HELD AT COLORADO SPRINGS, OCTOBER 6–9, WITH A LARGE ATTENDANCE.

THE Tenth National Irrigation Congress was held at Colorado Springs October 6–9, with nearly 500 delegates present from the various western states. The program of the four days devoted to the work of the congress was made up of discussions of the questions now most vitally affecting the west.

The workings of the new irrigation law, the preservation of the forests, and colonization were the topics that received special attention. The leading business interests of the west and the country in general were well represented, and the work of the congress should result in a great impetus being given the development of the west, and a consequent increase of prosperity in the country at large.

The opening session of the congress, held on Monday, October 6, was called to order by President Thomas F. Walsh. Immediately after calling the meeting to order, Mr. Walsh read the following telegram from President Roosevelt: "Accept my hearty good wishes. Nothing has been done in which I have taken a greater interest during my administration than the inauguration of nationally aided irrigation." Governor Orman then delivered the address of welcome, and was followed by Mr. Walsh, who spoke on "The Humanitarian Aspect of Irrigation." In the evening a reception was tendered the visiting delegates at the Antlers Hotel.

The morning session on Tuesday, October 9, was opened with a report of committees on credentials and on permanent organization. This was followed by the appointment of a committee on resolutions. Secretary Maxson then read his report.

Hon. Alva Adams, of Colorado, spoke on "Pathfinders and Pioneers;" Mrs. Gilbert McClurg, of Colorado Springs, extended greetings from the General Federation of Women's Clubs. President Slocum, of Colorado College, made an address on "The Universities' Interrest in Irrigation Problems."

There were also addresses by D. W. Lawler, Minnesota; R. W. Young, Utah; Willis Moore, Chief United States Weather Bureau. John H. Murphy spoke on "The Interest of Organized Labor in National Irrigation."

The discussion of forest problems was then taken up.

Prof. L. G. Carpenter spoke on "Necessity of Forestry Instruction in Western Educational Institutions;" Dr. Tarleton H. Bean, "Forestry at the Louisiana Purchase Exposition at St. Louis."

The afternoon session opened with an address by Hon. L. G. Powers, of the Census Bureau, on "The Irrigation Census." Hon. L. Bradford Prince spoke on "Harmony in the West;" Wesley A. Stuart on "Artesian Well Irrigation."

The beet sugar and irrigation discussion was taken part in by Herbert Myrick, J. G. Hamilton, J. F. Campion, Hon. R. W. Bonynge, Representatives Tawney and Morris. John W. Springer spoke on "The Relation of Live Stock Interests to National Irrigation," and Prof. Thomas Shaw on "Agricultural Production by Irrigation."

The colonization discussion was led by Hon. John Henry Smith, of Salt Lake, president Trans-Mississippi Con-

gress; Col. Thomas Holland, national secretary Salvation Army colonization; a paper by Commander Booth-Tucker on "Colonization" was read.

The evening session was held at Colorado College. There was an illustrated lecture by Clarence Johnston, U. S. Department of Agriculture, on "Irrigation in Egypt;" an address by Hon. F. E. Brooks on "The Future of Colorado under the Irrigation Act," and a series of stereopticon views of Colorado scenery by Gilbert McClurg, secretary Colorado Springs Chamber of Commerce, followed by a reception at Coburn Library of Colorado College by President Slocum and faculty.

Senators Patterson and Teller both addressed the congress on Tuesday, October 7.

On Wednesday there were addresses by Congressmen Tawney, Heatwole, Morris, and Stevens of Minnesota, and Williamson of Oregon, Hon. J. M. Carey of Wyoming, Senator Dietrich of Nebraska, and Hon. R. W. Bonynge. The national irrigation act was discussed by Mr. F. H. Newell, chief engineer of the reclamation survey. Mr. Elwood Mead, in charge of the irrigation investigations of the U. S. Department of Agriculture, also made an address.

One of the most important matters considered by the Congress was the question of merging the National Irrigation Congress with the Trans-Mississippi Commercial Congress. After much discussion it was decided that the National Irrigation Congress should retain its present identity for another year at least.

The following resolutions were adopted by the congress:

"The Tenth National Irrigation Congress felicitates the entire American people upon the enactment of the national irrigation act of June 17, 1902, one of the most beneficent and wide-reaching measures in the history of our legislation, and rejoices in the fact that its passage was due neither to partisanship nor sectionalism, but to the patriotic and united coöperation of men from all parts of the country, irrespective of political complexion.

"The grateful acknowledgments of this congress are due to Theodore Roosevelt, President of the United States, for his invaluable assistance in the cause of irrigation. His message to Congress in December, 1901, marked the beginning of a new epoch in the history not only of the arid west, but also in that of the whole region. Without his powerful aid and that of his administration it would not have been possible to secure the passage of that great act which will inaugurate and put into effective motion the national irrigation policy for which we have been striving so long. Great as his administration may be, we believe that none of its achievements will redound more to the greatness of our people and the glory of our country than will the passage of the national irrigation act. We send him our greeting and give him our assurances of our most sincere respect and admiration.

"We appreciate the invaluable assistance rendered to this glorious consummation by, and here express our sense of obligation to, the Secretaries of the Interior and of Agriculture, to the friends of the bill in the Senate and House, and to all who have labored so effectively and unceasingly to secure this inauguration of the policy for the reclamation by the national government of its arid empire—a policy which will be productive of greater good to a greater number than any governmental achievement of modern times.

"This congress, having confidence in the fairness, intelligence, ability, and integrity of the administration and in those officials of the Interior Department to whom is intrusted the execution of the national irrigation act, deem it inexpedient at this time to make specific recommendations regarding the manner of carrying the law into effect, or the policy that shall be pursued in the expenditure of the available funds, and leaves all questions relating to this subject to their discretion and judgment.

"We urge the enactment of adequate national and state laws for the preservation of our forests. Forest reserves should be extended wherever necessary for the preservation of the water supplies; more rangers should be appointed for the protection of the reserves from fire; adequate provision should be made

for the prompt extinguishment of all fires; burned areas should be reforested, and the national government should, wherever practicable, utilize its troops as a forest patrol, and, with the coöperation of the states, rigidly guard against forest destruction.

"We call attention to the recommendation of President Roosevelt in his message to Congress, in which he points out the overshadowing importance of a wise administration of the forest reserves for the perpetuation of the forests and their protection as sources of water supply.

"In this message the President made the following recommendations:

"'At present the protection to the forests reserves rests with the General Land Office, the mapping and description of their timber with the United States Geological Survey, and the preparation of plans for their conservative use with the Bureau of Forestry, which is also charged with the general advancement of practical forestry in the United States. These various functions should be united in the Bureau of Forestry, to which they properly belong. The present diffusion of responsibility is bad from every standpoint It prevents that effective coöperation between the government and the men who utilize the resources of the reserves, without which the interests of both must suffer. The scientific bureaus generally should be put under the Department of Agriculture. The President should have by law the power of transferring lands for use as forest reserves to the Department of Agriculture. He already has such power in the case of lands needed by the Departments of War and of the Navy.'

"We earnestly urge upon Congress the enactment at its next session of a law which will carry into effect this recommendation of the President in his message.

"We believe that the principles of irrigation and forestry and their relation to our social and economic problems should be taught in all the higher institutions of learning of the country.

"We urge the legislatures of the several states to provide for a full representation of their irrigation and forestry interests at the exposition to be held in St. Louis, Mo., in 1904, and pledge them our support, believing that such action will not only prove to be of incalculable educational advantage to the people directly interested, but will demonstrate to our own countrymen and to the world that the estimate which we place upon the importance of forestry and irrigation to mankind is not excessive.

"The Tenth National Irrigation Congress has learned with sorrow of the death of Maj. John Wesley Powell and mourns the loss as that of one of the pioneers in explorations and studies of the arid region. In particular we wish to express our profound appreciation of his unremitting efforts for national irrigation during the early days of the movement.

"We express our appreciation of the successful labors of the president and other officers of this congress, who have worked earnestly and faithfully, and the results speak for the value of their efforts.

"GEORGE H. MAXWELL,
"Chairman.

"D. W. WORKING,
"Secretary."

The National Irrigation Congress adopted a special resolution of thanks tendered to C. E. Wantland, of Denver, chairman of the national executive committee, and to Gilbert McClurg, of Colorado Springs, chairman of the local committee on arrangements, and to the Chamber of Commerce for their efficient and untiring efforts in making the congress a success and in looking after the comfort of the delegates.

It was decided to hold the eleventh National Irrigation Congress at Ogden, Utah.

The election of officers resulted as follows: President, Col. Edwin F. Holmes, Salt Lake, Utah; First Vice-President, Governor L. Bradford Prince, Santa Fé, N. Mex.; Second Vice-President, Anson J. McCune, Denver, Colo.; Third Vice-President, E. H. Libby, Clarkston, Wash.; Secretary, Col. H. B. Maxson, Reno, Nev.

GEORGE HEBARD MAXWELL,

EXECUTIVE CHAIRMAN OF THE NATIONAL IRRIGATION ASSOCIATION.

MR. MAXWELL, as a native of California, early became familiar with irrigation, and on the farm where he gained a living had ample opportunity to learn the advantages of abundant water. Becoming a successful stenographer, he was engaged in taking testimony in irrigation cases and learned thoroughly the technical and engineering side of the question, becoming expert in all of the matters concerning which he was likely to record facts. Later, as a lawyer, Mr. Maxwell made a specialty of the water laws of California, and with his characteristic thoroughness went to the very origin and studied the fundamentals of the water question. His practice led him to all parts of California, and in cases appealed to the Supreme Court of the United States he carried a knowledge of current usages and of the law as interpreted by various tribunals.

At the Fifth National Irrigation Congress, held at Phœnix, Arizona, December 15–17, 1896, Mr. Maxwell became prominently identified with the national

aspects of irrigation through his strong presentation of the importance of the construction of irrigation works by the federal government. In the early part of the meeting the cause he advocated seemed to be hopelessly outnumbered; but by his clear, logical presentation of the facts and the persistent representation of the importance of the matter, the convention was finally won over to his views.

From that time on Mr. Maxwell may be regarded as the central figure and leader in the national irrigation movement. He continued at subsequent irrigation congresses to urge appropriations by Congress for the construction of irrigation works, and believing that this could only be brought about by a more systematic action than that possible through the National Irrigation Congress, he organized The National Irrigation Association, a body composed of substantial business men. With funds assured through the activity of its members, this association, under the direction of Mr. Maxwell, was able to carry on a vigorous and effective campaign of education. Thousands of personal letters were sent out under the general scheme devised by Mr. Maxwell, and the manufacturers of the East, the men having investments in railroads, the cotton planters of the South, the labor unions, and many others interested in the development of the country and the making of more homes, responded liberally to the appeals, not only for money, but in personal presentation of the importance of the matter to their Members of Congress. The result was what might be expected, and it was only a matter of time when Congress must yield to the demands of the business interests of the country.

The result of the effective organization and campaign carried on by Mr. Maxwell is seen in the passage of the reclamation law of June 17, 1902. A recent complimentary banquet tendered Mr. Maxwell at Los Angeles, California, at which a number of men prominent in national and state affairs were present, testifies to the high appreciation of his services in this connection.

THE MICHIGAN FOREST RESERVE.*

By Thomas H. Sherrard,

Bureau of Forestry.

THE Michigan Forest Reserve includes about 60,000 acres of scattered lands in ten townships in the western half of Roscommon county and in two townships in Crawford county. Higgins and Houghton Lakes, around which the reserved lands lie, are the headwaters of the Muskegon River, while the northern end of the reserve extends over into the watershed of the Au Sable River. In the southern half of the reserve, around Houghton Lake, the land is low and often swampy over large areas; but the shores of Higgins Lake are higher, and the topography in the northern half is rolling. Low ridges alternate with flat, sandy plains and swamps. The geological formation is glacial. The soils are chiefly sands and gravels of poor quality, unfit for agriculture. The region is for the most part uninhabited, although at a few points the vicinity supports a scattered population.

The original forest on these lands comprised magnificent stands of White and Norway Pine. The character of this forest is shown by the accompanying illustration (Fig. 1), taken on the lands of the Thayer Lumber Company, which immediately adjoin the reserve on the west.

An examination of the reserve during the summer of 1901 by the Bureau of Forestry, in coöperation with the Michigan Forestry Commission, included a

* Read at the summer meeting of the American Forestry Association, held at Lansing, Mich., August 27 and 28, 1902.

general study of the condition of the existing tree growth throughout the reserve, made with special reference to the need for protection and the possibility for improvement of this growth.

In order to get an accurate and detailed description of the character of the growth on the cut-over and burned lands characteristic of the reserve, an area equal to one township was selected, which exhibited average conditions, and acre strips were run through this area at intervals of one-half of a mile. All trees on these strips down to one inch in diameter were counted and calipered, and careful note was made of the character of the ground cover and of the soil. In connection with the surveys, a study of the rate of growth of the common species, White, Norway, and Jack Pine, and White, Scarlet, and Red Oak, was made.

It must not be understood that this method of study should be extended to cover the entire reserve, as conditions do not require so detailed a study over a large area. But the results illustrate, in concrete form and on a small scale, the lines necessary to be followed in the practical management of the reserve.

From the 258 acres surveyed, a division of the area into types was possible, based on differences in the character of the growth and soil. The names of these types were suggested by the situations, as well as by the character of the growth. A rough estimate of the comparative representation of the several types distinguished is as follows:

	Per cen
Oak flat	32
Oak ridge	11
	— 44
Jack Pine barrens	39
Swamp	11
Hardwood land	6

FIG. I. VIRGIN FOREST OF WHITE AND NORWAY PINE ADJOINING THE MICHIGAN FOREST RESERVE.

A compilation of 100 acres surveyed on Jack Pine plains or pine barren type, gives the following figures for the average number of trees per acre, one inch and over in diameter: Jack Pine 88, Scarlet Oak 8, Norway Pine 1. Other species represented, each with an average of less than one tree per acre, are Aspen, Red Oak, White Pine, and White Oak. Jack Pine comprises nearly 90 per cent of all species.

The maximum breast-height diameter of Jack Pine was found to be 13 inches; but three-fourths of the trees are 5 inches and under, and the average diameter of Jack Pine 1 inch and over is but 4.4 inches.

A comparison of the volume tables constructed for Jack Pine shows the decided difference in the development of the species on different qualities of soil and locality. Two qualities were recognized.

Quality 1 includes trees on moist sand and gravel.

Quality 2 includes trees on the dry sands of the typical Jack Pine barrens.

Volume Table for Jack Pine.

	Quality 1.		Quality 2.	
Diameter, breast high, in inches.	Height in feet.	Volume in cords.	Height in feet.	Volume in cords.
1	10	..	9	..
2	20	..	17	..
3	29	..	24	..
4	36	.03	29	.01
5	43	.05	34	.02
6	48	.06	37	.04
7	52	.08	40	.05
8	56	.10	42	.07
9	59	.12	43	.09
10	62	.16	44	.11
11	64	.17	45	.14
12	65	.22	45	.16
13	66	.26	45	.19
14	67	.30	46	.22
15	68	.34	46	..
16	68	.38	46	..
17	69	.42	46	..
18	69	..	..	..

The soil of the Jack Pine plains is deep, fine sand, coarser and more gravelly where they merge with the oak flat type. It is too loose to afford sufficient support for large trees, and windfall was very common in the original forest, many trees being blown down before they reached a large size. The openings, where the Indians did not burn them over, came up in dense stands of small Norway and Jack Pine, the place being too dry for successful development of White Pine.

Omitting the figures for the other types, it will be sufficient to give the species in the order of their representation. It was found that the total number of trees per acre one inch and over in diameter on the oak flats was 94; on the oak ridges, 65. Scarlet Oak forms half the growth on the oak flats, while the Red Oak and White Oak together form more than 60 per cent of the growth on the oak ridges. Next in point of numbers on both types are Aspen and Jack Pine. Other species are Norway Pine, Red Maple, White Pine, Pin Cherry, and Birch.

With the exception of scattered White and Norway Pines, survivors from the original forests which were too small to cut at the time the pine was lumbered, the trees are young and small. The oaks are almost entirely sprouts. They range from one to twelve inches in diameter. The average diameter of the Scarlet and of Red Oak one inch and over in diameter is only two inches, and of White Oak 2.3 inches.

Many of the swamps have escaped burning. The total number of trees one inch and over in diameter on the average acre of swamp land is 241. Four species, Tamarack, Cedar, Spruce, and Balsam, form over 80 per cent of the growth. The swamps have been culled entirely of White Pine and partially of Cedar. The merchantable timber remaining consists of a small amount of Cedar, Tamarack, and a very small stand of spruce pulp wood.

Hardwood timber was but poorly represented in the original forest on the reserve. The hardwood forests remaining near the reserve belong to private owners. They have been culled of their pine timber, and often the Hemlock and the more valuable hardwoods

FIG. 2. GENERAL VIEW SHOWING CHARACTER OF LANDS IN THE MICHIGAN FOREST RESERVE.

have been lumbered. It was found that Beech and Hard Maple together formed 80 per cent of the stand in the hardwood forests, and Hemlock 11 per cent. On cut-over hardwood lands, Pin Cherry holds the first place in the second growth for the time being, while the representation of Maple and Beech together is reduced to 28 per cent.

Fig. 2 shows the character of the country included in the reserve, and gives a rough idea of the distribution of the types described. It was taken from the top of an oak ridge looking across an oak flat, pine plains, and scattered swamps to an oak ridge and hardwood land on the northern border of the reserve.

The effect of fires may be summarized as follows: the plains (Fig. 3) are more subject to fires than any other type. The deep sandy soil dries out quickly after a rain, and during a drouth, especially before or after the growing season, the accumulation of vegetable material becomes very inflammable. Pine seedlings germinate easily and in great numbers on the warm sands, but are largely killed by fire. The Jack Pine, by virtue of its remarkably prolific seeding, its resistance to fire, and its ability to grow on the poorest soil, does more under present conditions to restock the plains than any other species.

On sprout land, both on oak flats and oak ridges, the heavy fall of leaves and twigs affords abundant food for fire. The fierce fires which burned in the slashing left by lumbering, killed the oak which grew beneath the pines in the virgin forest. They sprouted freely from the roots, however, only to be killed back again by later fires. With repeated fires the growth becomes thinner and thinner and the sprouts more scrubby and stunted.

Swamps burn over only in exceptionally dry times, but when fire does penetrate a swamp it burns in the deep peat and is very destructive.

The effect of repeated fires on the ground cover is to eliminate differences due to different soils, and to reduce the cover on all situations to a few plants which resist burning. Characteristic plants are sweet ferns, blueberries, sedges, and dry land grasses, goldenrod, aster, etc. On the ridges grass and weeds are shaded out and give way to stunted oak sprouts.

Early lumbering left seed trees enough to reseed cut-over lands without the aid of planting, but the trees are rapidly disappearing before wind, fire, and theft.

Satisfactory reproduction starts again and again, but is always destroyed by fire. Recent lumbering has left no seed trees at all (Fig. 4).

For purposes of comparison and to show what growth has been possible under partial protection from fire, measurements were made in some of the few scattered bunches of second-growth pine which have been accidentally sheltered from destructive fires. On seventeen acres of second growth, on moist, loamy sand, the average stand per acre one inch and over in diameter was 349 trees (Fig. 5). White Pine, 29 per cent, average diameter, 7.4 inches; Norway Pine, 28 per cent, average diameter, 7.4 inches. Other trees were Red Maple, Beech, White Oak, Scarlet Oak, Birch, Hemlock, Jack Pine, and Aspen. There were 652 White Pines per acre under one inch and 117 Norway Pines. The total merchantable scale per acre, of pine five inches and over in diameter, was 31.6 cords; the average age was 70 years. The stumpage value would be about $74 per acre if the timber occurred in quantity.

FIG. 3. SHOWING DESTRUCTION OF JACK PINE BY FIRE.

FIG. 4. COMPLETE DESTRUCTION BY FIRE FOLLOWING RECENT LUMBERING.

FIG. 5. SECOND-GROWTH WHITE AND NORWAY PINE, WITH MIXTURE OF YOUNG HARDWOOD TIMBER.

SECOND-GROWTH NORWAY PINE POLES AND SEEDLINGS; RESULT OF ACCIDENTAL PROTECTION FROM FIRE.

On eight acres of second-growth Norway Pine on dry sand, the average stand per acre of trees one inch and over in diameter was 267 trees: Norway Pine, 77 per cent, average diameter 8 inches; White Pine, 9 per cent, average diameter, 10.8 inches. There were only 44 seedlings per acre, as recent fires had burned the ground nearly clean. The total merchantable scale per acre, of pine five inches and over in diameter, was 36.5 cords. The average age was 80 years and the stumpage value would be $78 per acre. These figures give an actual measure per acre of the growth possible under the unfavorable conditions now existing. They give no idea of the result which may be expected from systematic forest management.

With this brief review of the character of the forest covering and of the effect of fires upon it, I turn to the question of an organization for the practical management of the Reserve.

The success of forest management of these lands depends so entirely upon effective fire protection that the organization should aim first of all to provide a competent fire service. The agents of the Bureau of Forestry were strongly impressed with the feasibility of successful fire protection under a right organization of the Forestry Commission's own agents. Effective protection through the county or town organizations is utteriy out of the question.

While the organization and training of a fire service is of paramount importance, it can be on simple and inexpensive lines. The essential point will be the maintenance, during dangerous seasons, of a fire patrol and, as an indispensable aid to this patrol, the construction of artificial fire lines to supplement natural fire lines.

During the work in the summer of 1901, localities where fires are particularly liable to start were ascer-

tained; natural fire lines, such as streams, lakes, and swamps which do not burn over, were located and connected by a simple system of artificial fire lines. This system of fire lines, with other data, such as the location of danger points, lines of patrol, and vantage points for lookouts, were recorded on a fire-service map.

The organization recommended is a superintendent (or forester) in charge of the Reserve, with four assistants, to serve during the summer season. The superintendent should be empowered to hire extra help during the dangerous seasons of the early spring and autumn. The function of the force is not so much to fight fires as to prevent them. The cost of this organization would be about $3,000 a year, or five cents per acre. With consolidation and extension of the Reserve the cost would be reduced to less than one cent per acre.

Under a competent organization complete protection against fire will be absolutely assured over considerable areas. Wherever protection is certain, planting would become perfectly feasible. Where planting is necessary these lands could be planted with pine at an average cost per acre of not more than eight dollars. This sum would cover the cost of raising seedlings in seed-beds, transplanting to the nursery, and the final transplanting of the three-year-old seedlings at a distance of 6 x 6 feet. Thinning and tending are considered unnecessary. The investment at 3 per cent compound interest would amount to $35 per acre at the end of fifty years. The value of the product at the end of this period, roughly estimated at 40 cords per acre, would be $120, assuming a stumpage price of $3 per cord. This represents a net gain of $95 or $1.98 an acre per annum. This estimate is for White Pine; the figures given are purposely conservative.

MANAGEMENT OF MICHIGAN HARDWOOD FORESTS.*

By Walter C. Winchester,

Manager of the Foster-Winchester Lumber Company.

IN this paper I will endeavor to put before your association some of the reasons, as they appear to me, why the hardwood timberlands of Michigan are not lumbered so as to make it possible to harvest continuous crops of saw timber.

There are two main reasons: First, the profit that can be realized at the present time in cutting the lands clean; second, the excessive taxation on timberlands makes it unprofitable to hold them for the time necessary to grow a second crop. Added to these reasons is the indifference to the public welfare by many holders of timberlands.

The lumber manufacturer buying timber at the present time naturally cannot be in sympathy with the movement for conservative lumbering under existing tax laws. It is simply a business proposition of whether he can make more money by cutting all the timber on the ground at once, and utilizing the small timber for cordwood, charcoal, etc., or whether he can make more money by holding the younger timber for a continuous crop.

A big start in the right direction can be made by procuring the enactment of laws that will encourage the cutting of mature timber only. As timber is advancing rapidly in price timber-holders are ready to coöperate in any plan that will insure them a profit in future years.

The price of hardwood and hemlock lands in Michigan have advanced very materially during the last ten years. Lands that could have been bought ten years ago at $5 to $7 per acre are now selling at $20 to $25, and even higher. Hemlock bark commands double the price it did three years ago.

The lumberman, buying timber at these prices, is compelled to realize everything possible from the wood and by-products in order to make a profit.

* Read at the summer meeting of the American Forestry Association.

The up-to-date hardwood lumber plants are putting in charcoal kilns and chemical extractors. An example of how clean cutting is being carried on is shown at our plant at Slocum's Grove, Muskegon county, where we have charcoal kilns that consume fifty-five cords of wood every twenty-four hours. We utilize the tops and limbs and all timber that will not make sawlogs, taking the limbs down as small as two inches in diameter; the bark is peeled from all hemlock timber down to six inches. Hemlock timber as small as three or four inches in diameter can be sold at a profit for pulp-wood. All of the small wood, except Basswood and Hemlock, is used in making charcoal. We cut the small Basswood down to four inches in diameter for excelsior and heading bolts; the slabs and edgings from all the hardwood timber, except Basswood, are used for charcoal.

We make lath from the hemlock slabs and edgings, grinding the poorest and fine stuff into fuel for our boilers. Hemlock slabs and edgings that are not suitable for lath are manufactured into 16-inch wood for kindling, for which we find a ready market at a fair profit. Ferns, which are abundant, are picked and shipped to florists in the large cities. Thus it may be seen that if a tract of timber is handled with the idea of clean cutting, it can be worked up so closely that there will be nothing left but brush piles.

In cutting a cedar swamp the practical lumberman takes out all the straight timber for telegraph poles, cutting the balance into ties and shingle bolts, as the timber may be best utilized. The small timber is cut into posts. A standard post is four inches and up in diameter at the small end and cut in lengths of seven or eight feet. As the price of poles, ties, shingles, and posts has advanced materially in the past few years, they can be manufactured at a profit, leaving only the growth under four inches in diameter that is unmerchantable.

In cutting the mature timber from the average hardwood forests in Michigan, I think I would be safe in saying that no trees are cut for lumber that are under fifty years of age, except, perhaps, Basswood, Ash, and Elm. As the cull lumber from these sells at a fair price at the present time, they are cut down to a smaller diameter than other kinds. Generally speaking, hardwood under twelve inches in diameter is of little value for lumber. I also think I am safe in stating that the number of trees cut for lumber would not exceed one-third of the number of trees on a given area, if all trees four inches and up in diameter are counted.

Here, then, we have all this beautiful timber, most of which has taken forty to fifty years to grow, sacrificed for the small amount that can be realized from cordwood or charcoal.

I have shown you what can be realized at the present time from a tract of hardwood timber by cutting it clean. As to the raising of continuous crops by present holders of hardwood lands, it is a business proposition that can be brought about only by educatiug timber-holders that there is ultimately just as much, or more, money in cutting only the mature or merchantable trees, utilizing the tops for cordwood and charcoal and burning the brush. The value of wood in the tops and limbs of the mature trees will, in many instances, pay for taking care of the brush.

There is no question in my mind that the timber left after cutting the mature trees can be held at a profit for continuous crops, provided that a provision is made for a rebate of taxes in some equitable manner to owners who are willing to hold their land for such purposes. It would probably mean holding the timber thirty years or more for the second crop.

Cutting the large timber does not materially injure the younger growth. The underbrush comes up very rapidly after the large timber is out of the way, making a sure protection to the soil. However, unless you have tax laws that will encourage timber-holders and stimulate education along the line that it is not only for the public benefit, but for their benefit also, you can readily see that they would not be in sympathy with the movement. If the preservation of the forests is a public benefit, why should not the public be willing to bear the burden in this as well as other matters?

THE JACK PINE PLAINS OF MICHIGAN.*

By Filibert Roth,

Chief of Division R, General Land Office.

"IT is a pity your people failed in their attempt to introduce some kind of a state forest system," was suggested to a wide-awake ex-governor of one of the Lake States.

"Yes," he answered, "but our land is all agricultural land, it is needed for farms, and therefore there is no room for any forest experiments."

This is a representative view. At the same time, there is in this gentleman's state an entire county, and one of the older and larger ones at that, which has not enough of business to induce a railway company to extend its lines into any part of it. Nor is this sand-plain country an exception; it is only a part of a very considerable portion of that state, and, for that matter, of the entire area of the Lake States.

If we look a little closer into the farming, we find that in spite of the glowing descriptions of real-estate men and of the excellent efforts of the agricultural colleges and experiment stations, the sand is sand, and sand only. The yield is largely of one, or very few, kinds; this yield is uncertain; the clover may or may not catch for one, even for several seasons. The very soil itself is uncertain, and on every large clearing we see sand piled up by the winds along the fences, until many of these are buried in mobile sand dunes. During the spring and fall storms one may see the sands travel and drift like the snows of winter. A farmer who had cultivated this kind of land in Wisconsin and who had been successful enough to earn a better farm on the heavy clays of Marathon county, said, in explaining the sale of a forty-acre tract of this sand, "I had to sell it cheap; the sand had drifted in for several rods on all four sides, until a large part of the land was ruined."

The frugal Polack has succeeded here and there. To him a home, a tract of land on which he could breathe freely and be, for a time at least, without a master—to him any kind of land appeals. But this success is only temporary, and only partial; many families are ruined on these sand lands; there is unrest; men move away; new ones come, frequently falling prey to unscrupulous real-estate brokers. In time these conditions become more stable, abandoned farms remain abandoned, and just as in the case of many tracts in the older states, particularly New England, man "lets in the jungle"—he waits for the forest to heal up the many scars he has inflicted on the land. Fortunately for the Lake States, there is a climate and a tree which make this possible, and which in time will heal and cover up the dreariest sands.

This tree is the Jack Pine—that frugal scrub among the stately race of northern ever-greens. A prolific seed tree, with closed, resistant cones, a rapid grower, with an abundance of crown and foliage, this tree spreads over these barren lands, whether abandoned by other forest trees, ruined by fire, or left to waste by the farmer.

The northern Jack Pine does not stand alone; it is the representative of a much underrated group of pines occupying portions of nearly all parts of timbered North America. With its relatives, it shows frugality, tenacity, fertility, and no small degree of usefulness. Our northern Jack Pine fairly loves the sand, and to see it in its natural state, it gives the impression that sand alone is its proper home. A small scrub tree on the dry stretches along the prairies, it grows larger as the general conditions become more favorable, until it reaches a height of fully 100 feet in the regular pineries, with a diameter of 15 inches and over. But it is the small-sized tree,

* Read at the summer meeting of the American Forestry Association.

VIEW OF TYPICAL JACK PINE BARRENS, ROSCOMMON COUNTY, MICHIGAN.

in dense pure stands on the barren waste lands, which deserves particular consideration. Here one meets the Jack Pine, in forests of many miles in extent, practically alone in the make-up of the woods, as young timber 40 to 60 feet high, 10 to 12 inches in diameter, usually straight and sound, fully covering and protecting the ground. It is here that the farmer has begun to learn and appreciate the value of this scrub pine. It is here that thousands of people find their supply of fuel, and hundreds of portable mills are beginning to convert Jack Pine into ties, into dimension stuff, and even boards.

As with so many of our untried woods, the man who "knows it all" declared against Jack Pine. "It does not last; it is brittle, unsound, and of no use," and many more such clear-cut decisions condemned Jack Pine. This, of course, always preceded the actual trial, for so often the "practical" man, like other people, finds predictions much more convenient than a fair trial. Nevertheless, when railways needed ties, the choppers went for the Jack Pine, and when the farmer began to use Jack Pine rather than pay fancy prices for Norway or cull White Pine, he learned that hard pine is hard pine, and that, aside from its smaller size and less clear bole, the Jack Pine answered his purposes just as well as the Norway.

This same experince has been repeated elsewhere. The Jack Pine of the Rocky Mountains (the Lodgepole Pine) is cut into finishing material, and commonly passes under the name of White Pine in Wyoming and Montana.

In addition to furnishing useful material, this pine performs an important function in preparing the ground for more valuable trees. Here and there the sands may be so poor as to prevent the growth of other species, but this is rather the exception in the lake region. There are large stretches of Jack Pine to-day where White Pine was lumbered half a century ago. On the other hand, there are miles of old jack pine woods where one may see the Norway and even the White Pine returning. Cases have been seen by the writer where the Jack Pine has given way to Norway and White Pine until it was represented merely by scattered old veterans, long-shafted trees, dropping out one by one.

With others of its group, the north-

ern Jack Pine has several noteworthy peculiarities. Its firmly closed cones, often surviving even a hard forest fire, open so reluctantly that it has been asserted that fire was necessary for their opening. How long the vitality of the seed is retained in these cones has perhaps never been fully determined, but there is little doubt that it continues for a number of years. This peculiarity and its advantages are well known, and have been discussed so often that there is danger of its being overrated. Nevertheless, it appears certain that this peculiarity of the Jack Pine, together with its regularity and abundance of seed production, are the chief qualities which make the tree a regular "fire pine."

In its development the Jack Pine must be counted among the rapid growers, both in height and in diameter. In keeping with its scrub-pine character, however, this period of rapid growth is short, and is followed, not by a steady, moderate growth, but by a sudden and permanent decline in the rate of growth, which appears to indicate a short rotation for jack pine forests.

Unlike its common neighbor, the Norway Pine, the Jack Pine, like others of the scrub pines, departs in the formation of its crown from the regular form common among the pines. Its limbs are not regularly set in whorls, but extra limbs appear, inserted at irregular points, and thus disturb the

SCENE IN VIRGIN FOREST OF WHITE AND NORWAY PINE, MICHIGAN.

symmetry of the crown. This greater number of limbs, together with the more persistent short needles, gives its crown a peculiar appearance, a greater density and increased capacity, and has led to the designation of it and other members of this group as Spruce Pines.

The behavior of the Jack Pine in the woods is good. It stands considerable crowding; in fact, it rather needs crowding to clean sufficiently to make a useful timber. It is well able to cover the ground, and successfully keeps out weeds and brush, at least on the poorer lands.

To recapitulate, we have, then, in these sandy districts, locally known as "Jack Pine Plains" and common to all Lake States, a peculiar and yet very important condition. They are single-crop lands, sparsely settled in spite of the ease of clearing and working. They are farmed, but with poor and uncertain results. They are lands of small value, even in the older settled districts, shunned by every one acquainted with their real value. They are capable of a good growth of jack pine timber, and in most cases a systematic handling of these woods will render possible the return of better species.

In this way abandoned farms and waste lands will give way to the forest. A precarious crop of uncertain value is replaced by a fully assured crop of material which does not spoil in the bin, and for which there is always a market, and at present a steadily growing market. In addition, the return to the forest will secure this land against impoverishment and will do much to improve it. So that, even if a small amount of agriculture is to be carried on, the fields will enjoy the protection of the forest against the cold and dry winds which prevent the crops from taking hold, and which move and bury the very fields themselves.

THE TRESPASS PROBLEM, AND HOW TO SOLVE IT.*

By Ernest Bruncken,

Secretary Late Wisconsin Forest Commission.

NEARLY a hundred years ago, in Germany, G. L. Hartig, one of the founders of modern scientific forestry, said in his text-book: "Among the many evils to which forests are exposed, timber stealing stands at the head, because it is so general and so very injurious." Yet the timber thieves of his day and country were individuals, going stealthily into the woods with hooks or hatchet, to take a little brushwood for fuel, or at most cut a few saplings to supply their wants as small artisans. Hartig could not have conceived of the American trespass problem, where wealthy corporations set up sawmills on land that does not belong to them, and cut down whole forests in utter disregard of boundary lines and proprietary rights.

The trespass nuisance is so peculiarly irritating that one is apt to apply to the culprit names of which "thief" is the mildest. Yet the American people have done no less than to train, by solemn enactments, lumbermen to become trespassers on public property.

From the beginning the legal principle has been upheld—and I do not at all claim that it was a wrong or unwise principle in itself—that the unoccupied public lands are subject to utilization by whosoever chooses, unless there is a specific statute to regulate or prohibit such use. This doctrine was reiterated but a few years ago by the Supreme Court of North Dakota, in the case of Matthews *vs.* The Great Northern Railway Company (72 N. W. Rep., 1085), where it is held that there is an implied license to the public to go on the unappropriated lands of the United States, pasture cattle thereon, make and dispose of hay, cut and remove timber and

* Read at the Summer Meeting of the American Forestry Association.

the like. Timber stealing from public lands, therefore, is considered by the law not as something wrong in itself, but merely as "*malum prohibitum*," that is, something essentially innocent, which becomes wrong only because it has been expressly prohibited by statute. In accordance with this doctrine, criminal statutes against timber stealing have not usually made it a felony, punishable by imprisonment, but a mere misdemeanor, that can be atoned for by a fine, like neglect to pay a dog license.

There can be no reasonable doubt that this attitude of the law is entirely in accord with present public opinion. The public do not look upon the trespasser as a criminal. It is doubtful whether juries could be found to convict, if their verdicts meant that the accused would go to the penitentiary like a common thief. Even the fine imposed on trespassers by state and federal laws is often not insisted on by the public authorities, who are satisfied if the offender pays for the value of the stolen goods. Indeed, Congress has expressly sanctioned this practice by the law of 1878 (1 Suppl. Rev. Stat. U. S., page 329), which provides that the accused may relieve himself from criminal (though not from civil) liability by purchasing the land on which the timber was cut at the rate of $2.50 per acre. Compromises by which criminal proceedings were dismissed on payment of the costs of prosecution and the value of the stolen timber have been upheld by the Supreme Court (see Wells *vs.* Nickles, 104 U. S., 444). State authorities have acted on the same principles with regard to trespass on state lands, and been satisfied if they recovered the value of the stolen timber by civil proceedings.

Among foresters there will be no disagreement on the proposition that trespassing is pernicious to the welfare of the public forests. The public looks only at the value of the timber actually taken, but the forester realizes that the indirect injury by improper felling methods is apt to be even more serious. Trespassing must be stopped, if such a thing is possible. The question now is: how can it be done?

The first impulse in such matters is often to cry for more severe criminal laws and their strict enforcement. But such means would surely fail. Evidence sufficient to convict of crime is much harder to get than evidence fastening a civil liability on the offenders. Moreover, criminal prosecutions would usually be brought against some poor "lumber jack," or at most a superintendent or foreman, while the real offender, the millionaire director of the corporation, who reaped the benefit of the crime, would go scot-free. Wrongs cannot be cured by injustice. Suitable police regulations, imposing reasonable penalties on trespassers, are useful as supplementary means; but the real remedy must be sought elsewhere.

It was stated recently that public sentiment in the United States had from the beginning considered the public lands as the fair spoils of any one who chose to make use of them. Let us consider what may have given rise to this idea, which, by the way, is not peculiar to America, but found wherever unoccupied public lands exist. The forests and other resources of the public lands were created by nature without the aid of man. There was no sowing or planting, no sort of care by human hands or brains concerned in their production. It must be expected that people should consider themselves entitled to free use of these free gifts of the Creator. To the public consciousness there never has been a right of property that was not based on labor. True, ownership by the government is in reality ownership by all; but that is too abstract a proposition to have much force when it comes into conflict with the desire for a more direct and personal possession of a share in that of which each citizen is admitted to be a part owner.

Is it likely that public sentiment toward timber trespasses would remain what it is now if it were evident that the government was bestowing some labor and care upon its forests? Public opinion does not countenance the larceny of furniture from public buildings or trespasses committed in a public park, manifestly because it is felt that in these

things the ownership of the government is something real, based on human care and labor. The proprietary rights of the government in wild forests are mere abstractions. They will not become real to the public conscience until the government does not simply withhold from the citizens what nature has freely given to all, but expends on the forests such labor and care as will give it the rights of a real owner.

My proposition, then, is this: the trespass problem on public lands will be solved as soon as the government enters on a definite policy of managing its forests according to forestal principles. Of course, I do not mean by this that timber trespassers will thereupon at once reform and become good citizens. Greed and dishonesty will still need the strong arm of the law to curb them; but when everybody understands that the public forests are no longer simply the gifts of nature, but that the money of the tax-payers is being used to protect them against fire, to superintend lumbering operations, and to devise means of insuring their permanence, from that moment public sentiment will no longer wink at timber thefts any more than at burglary in the post-office. Then it will be far easier to enforce both criminal laws and civil regulations, that will make impossible at least those wholesale depredations which are now so common.

The very fact that public forests are under forestal management, even if it be of the most primitive kind, implies that there are some people on the land whose business it is to prevent trespassing. Every ranger and other forest officer would as a matter of course guard not only against fires but also against thieves. Even the simplest kind of forest management ought to imply also the utilization of the ripe timber wherever possible. If it is not yet found expedient for the state itself to do the felling, there should be a system of licensing by which private parties are allowed to purchase standing timber, cut and remove it under strict supervision by forest officials. Such a system has been successfully inaugurated in the federal forest reserves. Where a state establishes a forest reserve and neglects to make provision for the exploiting of the ripe timber on it, trespassers are simply invited to help themselves. They will reason—and most unsophisticated people will agree with them—that the government is letting a valuable resource go to waste, and that it is better for them to take possession than let the timber rot on the ground.

Forestal management of reserves will in still other ways enable us to prevent trespassing. One of the commonest excuses of trespassers when they are caught is that they did not know they were on the wrong side of the boundary line. Now it is certainly possible for such an error to be committed in good faith. The blazes and other marks of the government surveyor have become indistinct in the course of time and often entirely disappeared. One of the first things to be done by a forestal management of a state reserve should be an accurate demarcation of its boundary by the most conspicuous and permanent means practicable under the circumstances. When that is done trespassers will no longer successfully plead "that they didn't know they were doing it."

Of course, I will hear at once about the expense. The answer to that is once for all that all forestal management of public land reserves requires some initial expenditure, and no kind of expense is a better investment than a substantial marking of the boundary line. The Indian forest administration has in the course of forty years set up such boundary marks on over 46,000,000 acres of protected forest, and found it to pay. In many cases in this country a difficulty will be encountered from the presence of numerous small private holdings scattered through the reserves. Often it will be good policy to get title to these holdings either by exchange for lands outside the reserve or by outright purchase. On the other hand, it is by no means an unmixed evil to have a reasonable number of settlers living within the reserve. It gives an opportunity for obtaining a resident supply of labor which may be trained for the work and become interested in it—an inestimable advantage in all forestal

operations. I may suggest that one of the best kinds of boundary mark for a state forest reserve will be a public highway.

Having provided a proper, easily noticeable boundary to your reserve, and having placed on it a sufficient force of rangers, to combine the functions of fire guards, game wardens, and trespass agents, and having, moreover, impressed the public mind with the idea that you do not propose to let the timber go to waste, but utilize it for the common benefit, you will no longer be troubled with wholesale trespasses.

Further administrative regulations may then easily be devised to facilitate the work of the forest officials, and if criminal prosecutions should thereafter become necessary, far less difficulty will be found in convicting the offenders.

So far we have spoken principally of trespasses on reserved lands of the state. How about the public lands which it is not intended to hold for permanent forests? These lands are in most states scattered in parcels of quarter sections and even less. Obviously it would not be wise to spend money on marking their boundaries or to maintain a force of rangers for their protection. With regard to them, it seems to me the best policy, first of all, for each state having such lands to determine at once which tracts it wishes to retain as forest reserves. Having set these aside, all other lands ought to be disposed of as rapidly as possible for a fair value and to actual settlers only. In the meantime, if anybody helps himself to the timber, he ought to be made to pay the value of what he has cut. This merely requires that trespass agents, state's attorneys, and other officers do their duty in enforcing such payment by civil proceedings. In the case of lands which are to be disposed of to settlers, the state need not take into consideration the injury done to the forest by improper lumbering, as the forest is to be cleared off in any event.

Finally, as to trespasses on private lands, the state evidently has no duty to perform except to hold the courts open for the redress of any injury of which complaint is made. Private owners can well afford to take steps for the protection of their own holdings, and will naturally do so whenever it appears profitable.

The conclusion, then, which we have come to is that the trespass problem will be solved by precisely the same measures which will solve all other problems connected with the forests of this country, to wit, the introduction into the management of our forests of methods based on the art of scientific forestry.

THE CLIMATE OF THE WHITE PINE BELT.*

By Professor Alfred J. Henry,

U. S. Weather Bureau.

THE most striking feature of the geographic distribution of the White Pine, especially to the meteorologist, is the fact that the region of its occurrence, as a commercially valuable tree, coincides very closely with the region of greatest storm frequency in the United States. This fact seemed to be of sufficient interest to warrant a brief examination of the climate of that portion of the country in which the White Pine reaches its fullest development.

The botanical range of the White Pine is rather wide, and its adaptability to different climates is, on the whole, of a rather high order. It does not flourish in warm climates, nor to a marked degree on the lowlands of the interior valleys and Atlantic coast states, but in the cloudy, humid regions in and around the Great Lakes and far to

* Read at the Summer Meeting of the American Forestry Association.

the eastward it finds a congenial soil and climate, and there reaches its highest development, both in quality and quantity. In a general way the term White Pine Belt, as used in this paper, refers to an irregular belt extending from northeastern Minnesota on the west to the Canadian maritime provinces on the east. This main or central belt includes northern Wisconsin, northern Michigan, portions of Ontario, northern New York, and northern New England. There is also, or rather there were twenty years ago, extensive forests of White Pine in western and central Pennsylvania.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Normal Temperature	10°	15°	24°	38°	48°	58°	66°	65°	56°	44°	29°	18°	39
Warmest Month { year	1880	1877	1878	1878	1896	1894	1878	1878	1897	1879	1878	1877	
Warmest Month { deg	22	32	39	45	53	63	71	70	63	50	37	34	
Coldest Month { year	1885	1875	1872	1874	1888	1897	1891	1890	1886	1887	1880	1872	
Coldest Month { deg	-1	1	15	33	42	54	61	61	51	41	20	5	
Absolute Max. temp.	51	58	64	81	91	92	99	95	94	80	65	54	99
" Min. "	-41	-36	-26	3	25	33	45	40	29	8	-29	-34	-41
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	inches.
Normal Precipitation	1.1	1.1	1.7	2.4	3.7	4.5	3.7	3.3	3.9	2.6	1.6	1.4	31.0
Greatest Monthly	2.4	2.7	4.3	5.8	8.0	10.9	10.4	7.9	11.5	5.0	2.9	3.9	
Least "	0.4	0.1	0.4	0.3	1.4	1.0	0.5	0.5	0.3	0.1	0.7	0.1	
No. of days													
rain or snow	11	11	10	10	12	14	12	13	13	11	11	12	140
Clear	10	6	11	9	9	8	9	10	9	8	7	8	104
Partly Cloudy	11	12	10	11	12	13	15	13	12	11	10	11	141
Cloudy	10	10	10	10	10	9	7	8	9	12	13	12	120
Average date of first Killing frost Sept 20													
" " last " " May 5													

CLIMATIC DATA FOR DULUTH, MINNESOTA.

In defining the climate of a place, we are first concerned with the sum total of its atmospheric conditions and the average daily variation of the same. We wish to know about the temperature—what is the highest, the lowest, the average; how much rain falls, how it is distributed, etc.

Our second inquiry concerns itself with the modifying effect of elevation, proximity of the sea or other large body of water, the effects produced by winds blowing across different kinds of surfaces, and how these react upon the atmosphere.

The weather that is experienced every day in any region depends largely upon the movement of cyclonic storms, or atmospheric disturbances around the globe. If the region is situated within the tropics, where cyclonic storms are practically unknown, the weather of one day is almost precisely like that of its predecessor, and it is only at infrequent intervals that a marked change in the weather occurs. In the temperate zones the movement of cyclonic storms keeps the lower strata of the atmosphere in a continual state of agitation. One storm is quickly succeeded by another, and the atmosphere rarely becomes stagnated. In the white pine belt there are not only a large number of storms, but each class or type of storm brings its own distinctive weather; thus storms which enter the United States on the coast of Washington and Oregon and move along the northern boundary are preceded by warm southerly winds, increasing cloudiness, and rain or snow, according to the season.

On the other hand, disturbances which move northeasterly up the Ohio Valley are preceded and attended by strong northeasterly winds, relatively cool weather, and rain in the warm season and heavy snow in the cold season, thus insuring frequent periods of cloudy, rainy weather with intervals of bright sunshine. This may be said to be the

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Normal Temperature	16°	17°	23°	37°	49°	59°	65°	64°	57°	46°	31°	23°	40°
Warmest Month yr.	1880	1878	1878	1878	1887	1893	1878	1876	1891	1879	1878	1877	
Warmest Month deg.	28	33	40	44	58	65	70	70	63	56	38	35	
Coldest Month yr.	1875	1875	1885	1874	1890	1881	1891	1885	1873	1889	1881	1878	
Coldest Month deg.	7	2	12	30	42	54	60	58	52	40	24	12	
Absolute Max. Temp.	56	69	70	87	98	95	108	98	97	87	69	59	108
" Min. "	-26	-27	-16	3	22	31	38	33	28	12	-9	-20	-27
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	inches
Normal Precipitation	2.0	1.8	1.7	2.0	2.7	3.5	3.1	3.0	4.1	3.2	2.6	2.3	32.0
Greatest Monthly	4.1	5.2	4.4	5.1	6.6	8.6	6.7	7.7	12.7	6.1	5.4	8.6	
Least "	0.3	0.1	0.3	0.2	0.2	1.2	0.8	0.4	0.5	0.6	0.6	0.4	
No. of days -													
with rain or snow	15	13	13	11	11	12	12	12	13	15	15	16	158
Clear	4	4	8	9	9	9	9	10	8	5	3	3	81
Partly Cloudy	12	11	12	12	13	13	15	14	12	11	9	9	143
Cloudy	15	13	11	9	9	8	7	7	10	15	18	19	141
Average date of first Killing frost										Sept. 17			
" " last "										May 22			

CLIMATIC DATA FOR MARQUETTE, MICHIGAN.

dominating characteristic of the weather in the white pine belt.

When we extend our view of the weather so as to include a longer period of time, say a month, it then becomes possible to reduce our mental concept to numerical values. In the course of many years an approximate value for the mean temperature is determined; so also for the total precipitation, the average cloudiness, and other climatic elements. Thus we are able not only to form a clear idea of the climate of any one place, but also to compare climates and to note the distinctive features of one as compared with those of another.

The United States Weather Bureau, of the Department of Agriculture, has been making observations at a few points within the white pine belt during

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Normal Temperature	18°	18°	24°	37°	49°	60°	65°	64°	59°	45°	33°	24°	41°
Warmest Month yr.	1880	1882	1878	1878	1880	1893	1878	1878	1881	1879	1878	1877	
Warmest Month deg.	30	29	35	46	55	65	69	67	62	53	36	34	
Coldest Month yr.	1875	1875	1885	1874	1882	1881	1884	1885	1883	1876	1873	1876	
Coldest Month deg.	10	3	13	30	44	55	61	59	53	40	26	15	
Absolute Max. Temp.	52	59	66	79	95	97	98	95	94	87	67	56	98
" Min. "	-27	-27	-19	-2	22	33	40	39	28	15	-4	-15	-27
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	
Normal Precipitation	2.3	1.8	2.0	2.2	3.3	3.6	3.0	3.4	3.6	3.6	2.6	2.3	33.7
Greatest Monthly	5.2	5.0	5.6	4.2	7.4	8.5	6.1	8.0	9.1	13.2	5.3	5.6	
Least "	0.8	0.4	0.2	0.7	0.1	1.1	0.9	0.6	0.4	1.4	1.4	0.6	
No. of days with rain or snow	18	16	14	11	12	12	11	11	12	15	16	18	166
Clear	2	4	7	9	9	9	10	11	9	6	2	2	80
Partly Cloudy	12	11	12	12	12	14	14	13	11	11	10	9	141
Cloudy	17	13	12	9	10	7	7	7	10	14	18	20	144
Average date of first Killing frost										Sept 19			
" " last "										May 15			

CLIMATIC DATA FOR ALPENA, MICHIGAN.

the last 30 years, and it is now possible to define the climate of that region with a fair degree of accuracy.

Climatic tables are presented herewith for three points—Duluth, in the extreme western portion of the belt, and Marquette and Alpena, Michigan—those points being considered as typical of the climatic zone in which the White Pine reaches its fullest development.

The total annual precipitation of the white pine belt averages from about 30 inches in eastern Minnesota to over 40 inches in the Canadian maritime provinces. The greater part of the belt within United States territory, however, has an average of from 30 to 35 inches, one-fourth of which is in the form of snow. Snow falls in November and lies on the ground, as a rule, until toward the end of April. The average depth varies greatly. On the upper peninsula of Michigan and in the Georgian Bay region 125 to 150 inches fall annually, while on the southern edge of the belt and at a somewhat greater distance from large bodies of water the fall is not much more than 50 inches.

The distinguishing characteristics of the precipitation of the white pine belt are, uniformity of distribution throughout the year and great frequency of small rains. The frequency of small rains or days with rain is best illustrated by a comparison with points to the westward. Thus the number of days with rain or snow at Bismarck, North Dakota, is on the average for the year 104; St. Paul, Minnesota, 117; Duluth, Minnesota, 140; Marquette, Michigan, 158; Alpena, 166.

The Great Lakes and connecting rivers within the white pine belt comprise within their borders about 100,000 square miles of water surface, an area greater than that of New England, New Jersey, Maryland, and Delaware combined. This great body of water exercises a marked control over the climate, not only of the lake region itself, but of the country far to the eastward.

In a region devoid of vegetation or forest covering, the soil radiates heat very rapidly during the season of diminished solar activity, and becomes intensely cold in the depths of winter. Likewise with the return of the sun and the increased insolation of the summer season, the soil becomes very warm, and these conditions of the soil—extreme heat in summer and cold in winter—react upon the superincumbent atmosphere and thus modify the climate. The land surface of the white pine belt is made up largely of areas from which the timber has been removed, but on which more or less underbrush remains and alternating tracts of cleared land and forest. Other things being equal, there is not much difference between a forested area on the one hand and a region of cultivated land on the other, so far as permanency of climate is concerned. It hardly seems probable that any material change in the climate of the white pine belt has taken place as a result of the wholesale removal of the timber. This belief is held for two reasons: First, the deforested areas in a number of cases have been recovered by a second growth of timber or by underbrush, thus preserving in a certain degree the character of the original covering. Second, suppose no timber whatever had been removed from the original stand; the only influence on climate that could properly be ascribed to the original forest cover would be increased evaporation and a very slight modification in the temperature. The increased moisture given off by the trees would rise in the air and be carried eastward by the prevailing westerly winds, so that the rainfall of the forested areas would not be increased by an appreciable amount, but there might be a small increase to the eastward

If the whole continent had mostly a hard and barren surface, the interior would be intensely cold in winter and hot in summer. The rainfall would be carried off rapidly, and evaporation would be diminished over the continent, while there would be no increase over the ocean. The net result of such a change in surface conditions would be a small diminution of rainfall on the globe. As it is impossible through human agencies to change the surface conditions, except over extremely small areas, it will at once be seen that all apprehensions of permanent change of

climate in the lake region are groundless

Returning now to the subject from which this digression has been made, I would remark that the influence of the Great Lakes on the climate of the white pine belt is largely thermal and is noticeable at all seasons. Consider for a moment the cycle of changes that the water undergoes each year. It reaches its highest temperature on Lake Superior, for example, in September, more than two months after the summer solstice. With the advent of cool weather in the autumn the surface film of water becomes chilled and sinks and warmer water rises to take its place. This process continues until the great mass of the upper layers of the water become cooled to about 39°. Ice does not begin to form until the first of January, and then along the shores only, the middle of the lake remaining open the entire winter. The air near the surface of the lake waters must therefore always be warmer than to the westward and northward, over the cold, frozen land surfaces, and this warmer air is carried eastward and southeastward by the prevailing winds, thus tempering the climate of those regions. In summer, while the soil is rapidly warming under the influence of solar radiation, the lake waters are responding much more slowly to the increased insolation, so that it frequently happens that the air and water temperatures are as much as 20° apart. The cooling effect of the lakes is felt far to the eastward and the advent of spring is thus delayed, since more time is required to heat the great mass of water within the lake region than the land surfaces to the west and southwest.

The development of the White Pine within the region of its occurrence can scarcely be attributed to the influence of climate alone, since it is occasionally absent from considerable areas within its own particular climatic zone; neither does it seem possible to correlate its growth and development with a single climatic element. It seems more probable that it should be ascribed to a fortunate combination of soil and climate, the dominating characteristics of the latter being somewhat as follows: First, an atmosphere containing a high percentage of moisture, with much cloudiness and, conversely, little bright sunshine; second, frequent small rains and snows, uniformly distributed throughout the year (about one-fourth of the precipitation is in the form of snow); and, third, relatively low temperature, absence of hot winds, and prolonged periods of high temperature.

SEPTEMBER FOREST FIRES.

GREAT LOSS OF LIFE AND PROPERTY IN OREGON AND WASHINGTON.

THERE were unusually destructive forest fires in several of the far western states during September. The fires in Oregon and Washington were the worst in many years, while in Colorado, Wyoming, and Montana an immense amount of timber was destroyed.

Washington.—On September 11 forest fires broke out in a number of places in Mason, Thurston, Chehalis, and Lewis counties. The towns of Elma, Folsom, Shelton, Mattock, Black Hills, Bucoda, Rainier, and Castle Rock were all threatened by the flames.

The fire was worst on the North fork of Lewis river, where 16 lives were lost, 32 families lost their homes, and $1,000,000 worth of timber was destroyed. Forty persons were saved by reaching an open space in the forest known as Speleyah Prairie. The Lewis River fire occurred within thirty miles of Portland, Oregon.

In Cowlitz county 140 sections of timber, valued at $1,000,000, was burned over. In the Rock Creek district, Clark county, the fires burned over large areas, and several lives are re-

EFFECT OF REPEATED FIRES IN A WASHINGTON FOREST.

ported lost. According to the press dispatches, mills, lumber, and standing timber in Chehalis county, valued at $1,000,000, were destroyed.

Fires also raged along the Great Northern Railroad between Skykomish and Wellington, greatly impeding traffic. The town of Enumclaw had a narrow escape from destruction by the flames.

Oregon.—Several lives and a great amount of farm property and timber was destroyed in this state by recent forest fires. The town of Palmer and the plant of the Bridal Veil Lumber Company were destroyed. Two boys were lost in the flames, and most of the residents of the village had a narrow escape, In Multnomah and Clackamas counties several hundred persons were left homeless by the fires.

The loss caused by these fires in Clackamas county alone is estimated at $700,000 Of this amount, $500,000 was on standing timber and $200,000 on farm property. The loss in the State of Oregon is estimated at over $1,000,000.

Colorado.—The forest fires in this state during the early part of September destroyed much valuable timber, especially in the vicinity of Allen's Park, St. Vrain Valley, Idaho Springs, and Long's Peak. The most serious fires occurred between Case and Shawnee, Estes Park, Grand Lake, and Mt. Fairchild, near Lawn Lake.

On September 18 fires were reported sweeping through the Rocky Mountain forests from central Colorado to the Wyoming line. A great amount of damage was done to the protective forests on the mountain slopes, which later is likely to affect the supply of water for irrigation. The damage to timber in the forest reserves of this state was not heavy, owing to active work on the part of the reserve officials.

Wyoming.—Forest fires in this state near the Colorado boundary line became so serious about the middle of September that Governor Richards decided to call on the Secretary of the Interior for aid in fighting the fires. After communicating with Governor Orman of Colorado, requests for aid were sent by both executives. Rain finally extinguished the fires after government officials and others had fought the flames for a number of days. The towns of Grand Encampment, Wyo., and Pearl, Colo., were threatened by the flames.

Fires were reported from almost every section of the state, and it is estimated that 300 square miles were burned over in Fremont county. There were serious fires in central Uinta county, the Jackson Hole country, and in the Shoshone Indian Reservation. Natrona county had a fire and the timber in the Big Horn Mountains was threatened by a large fire.

Montana.—This state had a number of serious forest fires during September. The most damage is reported from the Crazy Mountains, near Big Timber; also near Barnica and Anaconda. There was a destructive fire in the Flathead Indian Reservation, and also near Libby, and in the Dayton Creek country.

South Dakota.—On September 14 a fire was started near Mystic, in the Black Hills Forest Reserve, by sparks from a locomotive. The flames made rapid headway and for a time it looked as if great damage would result, but owing to the active work of the Reserve officials the fire was gotten under control.

California.—The mills of the Northwestern Redwood Co., in Mendozi county, were destroyed by a forest fire about the middle of September. The loss was $100,000. There was a forest fire in Devil Canyon, in the San Bernardino Reserve, early in the month. Forest fires along the north fork of the Yuba did considerable damage to viaducts and sluices.

The experience of the summer of 1902 has clearly demonstrated the great value of organized supervision of the forests on our public domain, and particularly of the protective forests of our western mountain districts. According to recent reports of Forest Inspector E. T. Allen, while the forests of the unprotected public lands of Colorado were on fire in many places, the reserves of that state suffered but little damage. Similarly, the mountain forests in nearly

every part of Wyoming were visited by severe fires. An enormous quantity of valuable timber was destroyed, to say nothing of the far more valuable young growth, the timber of the future, and the most effective part of the protection against erosion and waste of water. Much the same condition was noted in Montana, where the sun was darkened for days by the smoke from forest fires on the public lands outside the reserve, while the reserves remained practically unscathed. The striking difference between protected and unprotected public forests was seen in Washington State.

The difference between having a well-organized service, always on the lookout to prevent and capable to fight forest fires, and having no protection for these important mountain woods has never been felt so keenly before. In districts where a few years ago the very suggestion of a forest reserve aroused general opposition, the people today are petitioning to sucure for their woods the protection which an organized body alone can supply.

That the present force of rangers on the forest reserves have been able to restrict the damage from fire is significant in so far that it disproves clearly the statement, repeatedly made in public, especially in opposing appropriations for this purpose, that such a small force of men could never hope to patrol successfully such an enormous area as is included in the reserves. How misleading this claim is may readily be inferred from the following showing made in the fiscal year ending June, 1901: During that year about 1,600 fires were discovered and put out or fought by the reserve forces. Of these 1,600, about 1,300 were small fires, readily put out by the rangers, and yet most of these 1,300 fires were ready to grow into large fires and do immense damage. Of the large damage done by the other 300 fires, more than half was done on three of the reserves, so that the other 35 reserves remained practically uninjured. When it is considered that in a reserve like the San Francisco Mountains Forest Reserve in Arizona, where coal-burning engines at every heavy grade scatter masses of sparks over the tinder-like ground cover, the above is certainly an excellent showing.

THE WESTERN HEMLOCK.

DISCUSSION OF A TREE LIKELY TO BECOME PROMINENT IN THE WESTERN LUMBER TRADE.

IN these days of a rapidly diminishing timber supply and the search for new woods to take the place of the well-known varieties now nearly exhausted, many timber trees heretofore considered of little value for lumber are being exploited. In this connection, a recent publication* on the Western Hemlock is timely.

Western Hemlock has suffered so severely through the reputation of its eastern relative, among lumber manufacturers and consumers that it has at present scarcely any market standing. To remove this prejudice and to introduce the Western Hemlock to the market by pointing out its uses, its economic value, and the conditions under which it may profitably be grown, lumbered, and manufactured, was one of the purposes of a two seasons' study on the ground, the results of which are embodied in this report. The other purpose was to ascertain the qualities and possibilities for forestry of a tree that must inevitably take on great importance in conservative lumbering in the northwest.

The stimulus apparent in the lumber industry of the northwest within the last few years, with the recent immense investments in standing timber in that

*The Western Hemlock. By Edward T. Allen, Field Assistant, Bureau of Forestry. Bulletin 31. Pp. 55, plates XII. Washington, D. C.

region and the realization that its supply is limited, has created an interest in the long-despised Western Hemlock. This species forms 13 per cent of the forests of Washington and is abundant in many parts of Oregon. Apparent inability to utilize it is one of the most serious factors in the local lumber problem. Were it practicable for the Hemlock to stand unharmed until it became established in the market, there would be less cause for immediate concern; but, seldom growing in pure stands, the Hemlock, in mixture with the Red Fir, Spruce, and Cedar now being logged, is left standing by the lumbermen to be destroyed by fire, wind, or insects—a complete loss to the owner and to the community.

This waste is in line with the history of lumbering in the Northeastern and Lake States, but with more serious results and with less justification. The Eastern Hemlock is an inferior wood and therefore was left uncut until more valuable species became scarce. The disadvantage of the Western Hemlock has not been its quality, but its confusion with the eastern species. It has been condemned without trial, except by a few who, realizing the difficulty of convincing the market, have manufactured, under the names of Fir, Spruce, or Alaska Pine, as much Hemlock as they dared without fear of detection.

The importance of bringing Hemlock into the market on a large scale is now being realized, and its surreptitious use is somewhat greater than it was formerly. There is still, however, a total lack of organized effort, and practically nothing is done to acquaint the consumer with its merits. Mr. Allen shows that in strength, ease of working, and freedom from warp and shake, Western Hemlock differs greatly from the eastern species, whose deficiencies in these respects are its chief drawbacks. Western Hemlock cannot be classed in strength with Oak, Red Fir, or Longleaf Pine, nor is it suitable for heavy construction, especially where exposed to the weather; but it possesses all the strength requisite for ordinary building material.

TYPICAL MIXTURE OF RED FIR AND WESTERN HEMLOCK, BLACK HILLS, WASHINGTON.

The author states that Western Hemlock is best adapted for uses which require ease of working, a handsome finish, and lightness combined with considerable strength. It has been found suitable for flooring, joists, and scantling, laths, siding, ceiling, box shooks, turned stock, newel and panel work, woodenware, and paper pulp. It is, however, for finishing and box manu-

facture that it is most certain of appreciation when it becomes better known. Taking a high polish, free from pitch, and, when properly sawed, showing a beautiful grain, it is an excellent wood for wainscot, panels, and newels. It is harder and less easily dented than Redwood or Cedar, and has a uniformly firm grain, which on drying does not show the minute corrugations characteristic of Red Fir and other trees having a marked difference between summer and fall wood.

Of greater economic importance, however, is the use of Hemlock as a substitute for Spruce and White Pine in the manufacture of boxes. The scarcity of timber suitable for this purpose is a cause of much concern even in the West.

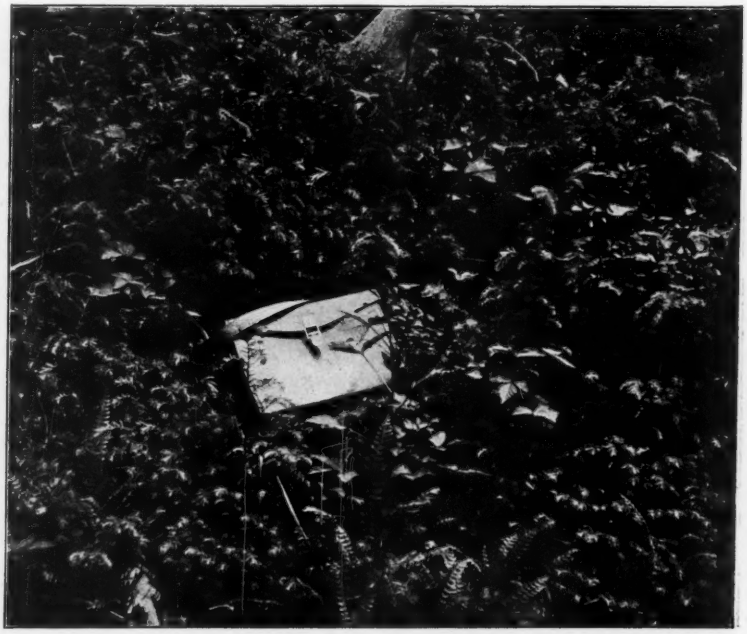
The conclusions to which this study has led may be briefly summarized as follows:

(1) The wood of the Western Hemlock is far superior to that of the eastern tree. It is suitable for use in all ordinary building work; it furnishes good paper pulp; it is sufficiently light and strong to make excellent woodenware stock, and it is particularly valuable for indoor finishing. Its bark is half again as rich in tannin as that of the eastern tree.

(2) Under favorable conditions the Western Hemlock reproduces abundantly and grows very rapidly. Since these conditions are usually disadvantageous to Red Fir, Hemlock may often be counted upon to reforest cut-over lands when Red Fir would probably fail to establish itself.

(3) The Western Hemlock has now to contend mainly with prejudice which is based upon a knowledge of the eastern tree alone. The importance of bringing it into the market on a large scale as a substitute for Spruce and White Pine is growing rapidly. Its qualities entitle it to rank among the valuable timber trees of this continent.

This bulletin discusses the diseases and insect enemies of the species, its range and habits, rate of growth, and reproductive power. The manufactur-



HEMLOCK SEEDLINGS GROWING ON ROTTEN WOOD.

A WESTERN HEMLOCK, CASCADE MOUNTAINS, WASHINGTON, SHOWING THICK, ROUGH BARK OF THE MOUNTAIN FORM.

ing and market problems are discussed and the production of bark and its value for tanning purposes noted.

Mr. Allen's bulletin is a valuable addition to forest literature, and the information it contains should do much to bring about a better appreciation of the merits of a tree that he feels "is going to play an important part in the lumber trade of the northwest." The matter contained in this publication is of special value from the fact that Mr. Allen is a trained forester, intimately acquainted with lumbering methods of the northwest through residence there, and this bulletin is the result of several years' study in the forests of Washington.

The accompanying illustrations are reprinted here through the courtesy of the Bureau of Forestry.

RECENT PUBLICATIONS.

Birds that Hunt and Are Hunted. By NELTJE BLANCHAN. Illustrated with 48 colored plates. Pp. 359. Price, $2.00. Doubleday, Page & Co., New York.

This handsome volume on "Birds that Hunt and Are Hunted" is by Neltje Blanchan, the author of that deservedly popular book "Bird Neighbors." In the present volume the author describes 170 birds of prey, game birds, and water fowl. The book contains an unusually large amount of popular information for sportsmen concerning the leading game birds. This book, which belongs in the series known as the New Nature Library, is a companion volume to "Bird Neighbors," the two forming a complete popular ornithology.

This book contains 48 plates of birds in natural colors, an introduction by G O. Shields (Coquina), and is now in its third edition. It is divided into four parts, as follows: Part I is devoted to water birds, Part II to wading birds, Part III, gallinaceous game birds, and Part IV, birds of prey. This book should have a place in every sportsman's library.

Familiar Trees and Their Leaves. By F. SCHUYLER MATHEWS. With 12 colored plates, 200 drawings from nature by the author. Pp. 320. Price, $1.75 net. D. Appleton & Co., New York.

This artistic volume contains a large amount of interesting information concerning the better-known trees of the eastern United States. The botanical name and habitat of each tree is given, along with a record of the precise character and color of its foliage. The book is illustrated with twelve plates in colors of representative trees, and 200 drawings from nature of leaves and seeds of the best-known species.

This book will prove of great value to students who wish to become familiar with the more common trees. At the end of the volume there is an index giving the common and botanical names of the trees of the eastern United States

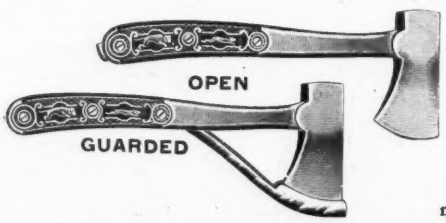
"Familiar Trees and Their Leaves" has been prepared with the usual care that Mr. Mathews has shown in his other book.

Thirteenth Annual Report of the Missouri Botanical Gardens. Pp. 133. Illustrated with 99 plates St. Louis, Mo.

The thirteenth annual report of the Missouri Botanical Garden at St. Louis, Mo., is an unusually interesting number. The formal reports of the Director and of Officers of the Board occupy only a few pages, while the major part of the 133 pages of printed matter comprises an exhaustive revision and technical study of the *Yuccea* or Yuccas, by Dr. William Trelease, Director of the Garden. One hundred excellent half-tone plates (including one heliotype) from photographs and drawings, amply illustrate the distribution and the characters of the species and varieties discussed.

It is, perhaps, not generally known that some fifteen of these curious plants form a conspicuous part of the forest growth of many desert or dry regions in southwestern and southern North America. Ten of these tree yuccas occur within the borders of the United States and about five are Mexican or Central American. The yuccas are useful ornamental trees and deserve wider use in suitable climates. Their leaves furnish a strong fiber for ropes, while the wood of some species is used in making furniture. The large, bulky flowers of one species are extensively eaten by cattle and sheep. The banana-like fruit of several species is said to be eaten by Mexican and Indian children; but the writer suggests as probably correct, a comparison of the taste of this fruit with that of "black-currant jam flavored with quinine."

The principal species formerly included in the *genus Yucca* have, as a result of Dr. Trelease's sixteen years of close study, been divided among three genera—*Hesperoyucca*, *Clistoyucca*, and *Yucca*. Important differences in the flowers, fruit, and seeds appear to justify this new classification. We take pleasure in saying that Dr. Trelease's contribution to the scanty literature of this group of little-known plants, will give much-needed aid to students and others interested in the yuccas.



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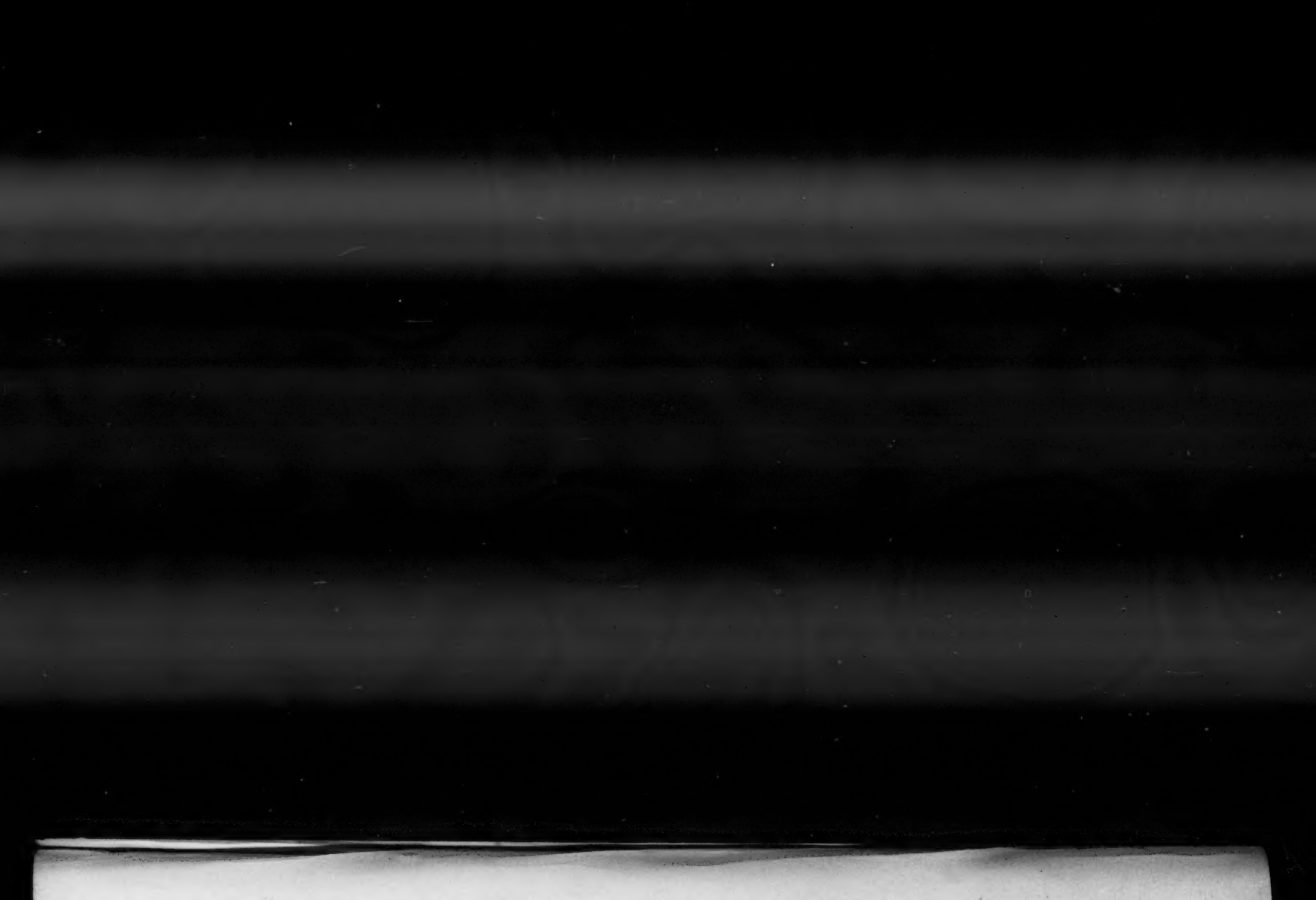
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